2381

FIELD AND LABORATORY REPORT

WATER QUALITY SURVEY

BASF WYANDOTTE CORPORATION
North and South Plants

PENNWALT CORPORATION
East and West Plants

and

DETROIT EDISON COMPANY
Wyandotte Plant

1971

69A

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
Michigan District Office
Grosse Ile, Michigan

FIELD AND LABORATORY REPORT
JUNE 1971

Summary

A water quality survey was conducted by the U.S. Environmental Protection Agency, Lake Huron Basin Office on the Detroit River and waste outfalls between mile points 12.0 and 16.0 along the Michigan shoreline. The survey area and outfalls are depicted in Figure 1. The industries surveyed include:

BASF Wyandotte Corp., North & South Works
1609 Biddle
Wyandotte, MI 48192

Pennwalt Corp.
Industrial Division, East & West Plants
4655 Biddle
Wyandotte, MI 48192

Samples were collected by boat from the outfalls, water intakes, and from the river. Observations of the effect of each discharge were recorded, along with estimates of flow. Data obtained are used to evaluate compliance with interstate water quality standards and enforcement conference effluent stipulations.

LHBO participants were:

Field Surveys (sample collection and observations)
Ross Powers, Field Operations Chief
Ed McCue
Michael Dziak
Harold Henris
Jasper Clemente

Laboratory Personnel (sample analysis)
Wm. Bojarski, Laboratory Chief
Charles Elly
Judy McLane
Wm. Collinson
Shirley Wardell

Conclusions

BASF Wyandotte Corp. -

North Plant - The effluent stipulation for suspended solids of 50 mg/l was exceeded at W27 on June 22 and 24, with values of 109 and 56 mg/l (Table 1).

South Plant - The effluent stipulation for suspended solids of 50 mg/l was exceeded at W23 on June 21, 23, and 24, with values of 65, 70, and 68 mg/l (Table 1).

Pennwalt Corp. -

East Plant - The effluent stipulation for suspended solids of 50 mg/l was exceeded at W14 on June 24, with a value of 60 mg/l (Table 1).

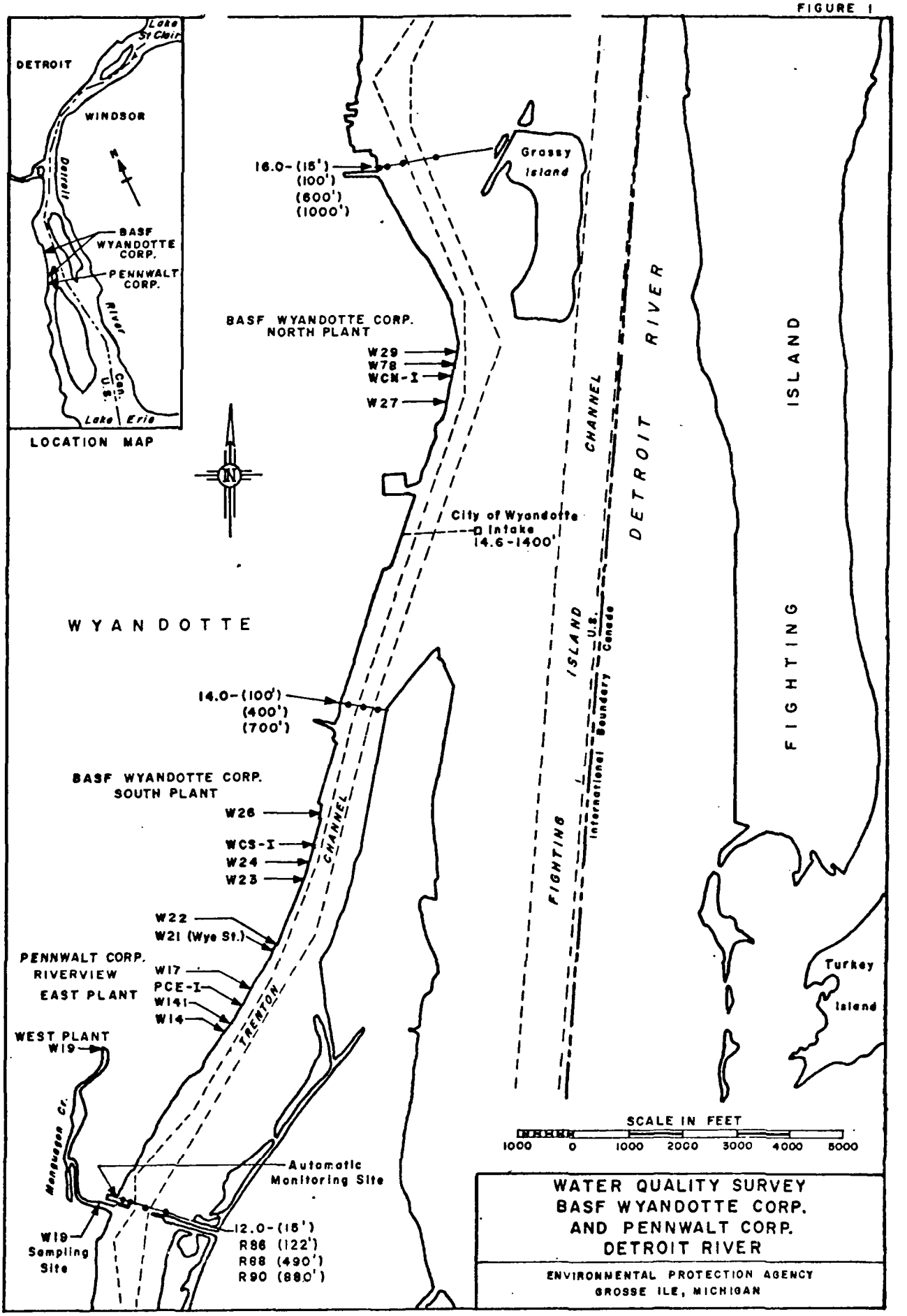
West Plant - During the four-day survey, no stipulation was found to be exceeded.

Survey Methods

The survey was conducted by boat and consisted of documenting outfall and river station locations, and sampling and documenting observations of effluent and river conditions. Flow estimates were made by estimating the flow velocity and measuring the depth of flow in the outfalls. Current flow data were obtained from the Michigan Water Resources Commission. Photographs were taken of the outfalls and unusual conditions in the river.

Samples were obtained on each of four days by collecting grab samples from each station on a rotational schedule three times per day, and compositing a portion into a single bottle for each station. In addition, individual grab samples were obtained if unusual discharges were observed.

FIGURE 1


DETROIT
Lake St Clair
WINDSOR
Detroit
BASF WYANDOTTE CORP.
PENNWALT CORP.
River
Lake Erie
LOCATION MAP
16.0-(15')
(100')
(600')
(1000')
Grassy Island
BASF WYANDOTTE CORP. NORTH PLANT
W29
W78
WCN-I
W27
DETROIT RIVER
CHANNEL
ISLAND
City of Wyandotte Intake 14.6-1400'
WYANDOTTE
14.0-(100')
(400')
(700')
U.S. International Boundary Canada
FIGHTING ISLAND
BASF WYANDOTTE CORP. SOUTH PLANT
W26
WCS-I
W24
W23
W22
W21 (Wye St.)
PENNWALT CORP. RIVERVIEW EAST PLANT
W17
PCE-I
W141
W14
TRENTON CHANNEL
WEST PLANT
W19
Monguagon Cr.
Automatic Monitoring Site
W19 Sampling Site
12.0-(15')
R86 (122')
R88 (490')
R90 (880')
Turkey Island
SCALE IN FEET
1000 0 1000 2000 3000 4000 5000
WATER QUALITY SURVEY
BASF WYANDOTTE CORP.
AND PENNWALT CORP.
DETROIT RIVER
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN

An automatic monitor, aboard the laboratory boat located downriver below the outfalls at river mile 12.02, was operating to record temperature, dissolved oxygen, and conductivity. The river stations and outfalls are illustrated on Figure 1 and described as follows.

Station Code	Description
16-15	16 miles upstream from Detroit River Light, 15 ft. off U.S. shore
16-100	16 miles upstream from Detroit River Light, 100 ft. offshore
16-600	16 miles upstream from Detroit River Light, 600 ft. offshore
16-1000	16 miles upstream from Detroit River Light, 1000 ft. offshore
W29	BASF Wyandotte Corp. North Plant - 12 ft. box sewer with cables across opening (river mile 14.90)
WCN-I	BASF Wyandotte Corp. North Plant - water intake 100 ft. upstream of W28, river mile 14.89
W27	BASF Wyandotte Corp. North Plant - 18 ft. irregular opening in breakwall (river mile 14.86)
CWW-I	City of Wyandotte water intake, river mile 14.6, 1400 ft. off U.S. shore
14-100	14 miles upstream of Detroit River Light, 100 ft. off U.S. shore
14-400	14 miles upstream of Detroit River Light, 400 ft. off U.S. shore
14-700	14 miles upstream of Detroit River Light, 700 ft. off U.S. shore
W26	BASF Wyandotte Corp. South Plant - submerged outfall at north end of breakwall (river mile 13.29)
WCS-I	BASF Wyandotte Corp. South Plant - water intake adjacent to power plant.

Station Code	Description
W24	BASF Wyandotte Corp. South Plant - 7 ft. x 5½ ft. box sewer by pipeline sign (river mile 13.10).
W23	BASF Wyandotte Corp. South Plant - 8 ft. box sewer (river mile 12.97)
W22	BASF Wyandotte Corp. South Plant - 40 in. x 24 in. box sewer, upstream of Wye St. (W21) overhead pumping station (river mile 12.90)
W21	Both BASF Wyandotte Corp. South Plant and Pennwalt Corp. East Plant discharge from W21 at River Mile 12.89. During normal river level, wastes discharge from a 3 ft. box sewer located at river level. During high stage, wastes are pumped to two Wye St. 30 in. diameter pipes located about 10 ft. above river level. (During this survey, wastes were discharging from W21 - Wye St.)
W17	Pennwalt Corp. East Plant - 10 ft. x 4 ft. rectangular outfall with twin 5 ft. x 4 ft. sewers leading into the main sewer (river mile 12.72)
PCE-I	Pennwalt Corp. East Plant water intake (river mile 12.59)
W141	Wayne County Drain No. 5 - Pennwalt Corp. East Plant prime contributor (river mile 12.45)
W14	Pennwalt Corp. East Plant - 5 ft. x 50 in. box sewer (river mile 12.35)
-	Automatic water quality monitoring site, Riverview boat ramp; 100 ft. upstream of river mile 12.0 (river mile 12.02)
12-15	12 miles upstream from Detroit River Light, 15 ft. off U.S. shore.
R86	12 miles upstream from Detroit River Light, 122 ft. off U.S. shore (12-122).
R88	12 miles upstream from Detroit River Light, 490 ft. off U.S. shore (12-490).
R90	12 miles upstream from Detroit River Light, 880 ft. off U.S. shore (12-880).
W19	Monguagon Creek, 125 ft. upstream of the confluence with Detroit River at river mile 11.99. Pennwalt Corp. West Plant W19 outfall is located about 2500 ft. upstream in Monguagon Creek from sampling site.

Many of the outfalls were found to be submerged and/or inaccessible to sampling from the survey boat. Other outfalls (W21) facilitate

discharges from both BASF Wyandotte and Pennwalt Corporations. Therefore, it was not possible to fully define the waste loadings. To accomplish this, more detailed in-plant surveys would have to be conducted.

Laboratory Procedures

Each sample was analyzed for conductance and pH aboard the laboratory boat BLUE WATER before compositing. The completed composite samples were returned to the LHBO laboratory at Grosse Ile for analysis of chlorides and suspended solids. All samples were analyzed using FWPCA Methods for Chemical Analysis of Water and Wastes, November 1969, USDI and Standard Methods for the Examination of Water and Wastewater, 12th Edition.

Results

Because of the difficulty of finding the outfalls and measuring flows, current flow data were obtained from the Michigan Water Resources Commission. These flows are reported by the company in their monthly operation report and are the averages for May 1971. Flow data from the 1963 MWRC surveys are also used to find waste loads in this report.

Company	Outfall	FLOW (MGD) 1963 Survey	May 1971
Pennwalt Corp.			
West	W19	6.77	5.76
East	STP outfall	-	1.2
"	W14	4.32	4.4
"	W141	-	9.5
"	W17	28.0	16.9
"	W21	6.5	4.7
BASF Wyandotte			
South	W21	.22	3.44
"	W22	.335	0.61

Company	Outfall	FLOW (MGD) 1963 Survey	May 1971
BASF Wyandotte			
South	W23	13.53	19.4
"	W24	1.01	0
Propolene Oxide Plant	W26	1.013	2.37
North	W27	48.2	43.2
"	W68	1.19	2.16
"	W29	1.26	3.3
"	W69	1.93	5.1
"	A1	-	4.68

Laboratory Analysis Results

The laboratory analysis results and the computed waste loadings are listed in Tables as follows:

Table	Title
2	River Grab Sample Analysis Results
3	Outfall Analysis Results
4	Net Waste Loadings Using 1963 Flows
5	Net Waste Loadings Using 1971 Flows

Field Observations

A summary of field observations of adverse effluents is given in Table 6 and the field descriptions in Table 7. The results of the automatic monitor aboard the laboratory boat are given in Table 8.

TABLE 1a
COMPLIANCE SUMMARY - EFFLUENT STIPULATION

Outfall No.	Date 1971	Suspended Solids (mg/l)	Chloride (mg/l)	Oil (mg/l)	Violation*
BASF-Wyandotte Corp. -					
North Plant					
Intake	6/21	9	10		
(WCN-I)	6/22	11	11		
	6/23	9	11		
	6/24	9	11		
	Avg.	10	11		
W27	6/21	28	54		
	6/22	120	170		Susp. Solids - 110 mg/l
	6/23	28	63		
	6/24	65	49		Susp. Solids - 56 mg/l
	Avg.	60	84		
		(lbs/day)	(lbs/day)		
Net Waste-	6/21	7,600	18,000		
load	6/22	44,000	64,000		
(1963 Flow)	6/23	7,600	21,000		
	6/24	23,000	15,000		
	Avg.	21,000	30,000		
Net Waste-	6/21	6,800	16,000		
load	6/22	39,000	57,000		
(1971 Flow**)	6/23	6,800	19,000		
	6/24	20,000	14,000		
	Avg.	18,000	26,000		
Stipulation*		50 mg/l	1,300,000	15 mg/l	

NOTE: Effluent from W68, W29, W69, and A1 not sampled. Flow from W27 comprises 75% of total flow from plant, using 1969 average State data, chloride load from North Plant in the order of 50,000 lbs/day. Other wastes piped to Fighting Island in Canada for disposal. Overflows from waste beds are not monitored.

* Result of company operation - net
** Based on company monthly flow avg. for May 1971.

TABLE 1b
COMPLIANCE SUMMARY - EFFLUENT STIPULATION

Outfall No.	Date 1971	Suspended Solids (mg/l)	Chloride (mg/l)	Oil (mg/l)	Violation
BASF-Wyandotte Corp. -					
South Plant					
Intake	6/21	11	12		
(WCS-I)	6/22	13	20		
	6/23	14	20		
	6/24	16	24		
	Avg.	14	19		
W23	6/21	76	210		Susp. Solids - 65 mg/l
	6/22	59	490		
	6/23	84	420		Susp. Solids - 70 mg/l
	6/24	84	580		Susp. Solids - 68 mg/l
	Avg.	76	420		
W21	6/21	20	35		
	6/22	35	44		
	6/23	26	40		
	6/24	30	78		
	Avg.	28	49		
		(lbs/day)	(lbs/day)		
Net Waste-	6/21	7,300	22,000		
load	6/22	5,200	53,000		
(1963 Flow)	6/23	7,900	45,000		
	6/24	7,700	63,000		
	Avg.	7,000	46,000		
Net Waste-	6/21	10,000	33,000		
load	6/22	8,000	77,000		
(1971 Flow**)	6/23	11,000	66,000		
	6/24	11,000	92,000		
	Avg.	10,000	67,000		
Stipulation*		50 mg/l	550,000	15 mg/l	

* Result of company operations - net
** Based on company monthly flow avg. for May 1971.

TABLE 1c
COMPLIANCE SUMMARY - EFFLUENT STIPULATION

Outfall No.	Date 1971	Suspended Solids (mg/l)	Chloride (mg/l)	Oil (mg/l)	Violation*
Pennwalt Corp. -					
East Plant					
Intake	6/21	10	29		
(PCE-I)	6/22	11	41		
	6/23	15	30		
	6/24	9	42		
	Avg.	11	36		
W21	6/21	20	35		
	6/22	35	44		
	6/23	26	40		
	6/24	30	78		
	Avg.	28	49		
W17	6/21	34	40		
	6/22	26	82		
	6/23	26	69		
	6/24	14	100		
	Avg.	25	73		
W14l	6/21	53	830		
	6/22	58	240		
	6/23	59	600		
	6/24	57	720		
	Avg.	57	600		
W14	6/21	50	70		
	6/22	53	65		
	6/23	41	87		
	6/24	69	720		Susp. Solids - 60 mg/l
	Avg.	53	240		
		(lbs/day)	(lbs/day)		
Net Waste-	6/21	11,000	67,000		
load	6/22	10,000	27,000		
(1963 Flow)	6/23	7,600	57,000		
	6/24	8,300	94,000		
	Avg.	9,200	61,000		
Net Waste-	6/21	8,700	66,000		
load	6/22	8,200	23,000		
(1971 Flow**)	6/23	6,500	53,000		
	6/24	7,500	89,000		
	Avg.	7,700	58,000		

TABLE 1c (cont'd)
COMPLIANCE SUMMARY - EFFLUENT STIPULATION

Outfall No.	Date 1971	Suspended Solids	Chloride	Oil	Violation*
East Plant		(mg/l)	(lbs/day)		
Stipulation**		50	500,000		

*Result of company operations - net
**Based on company monthly flow avg. for May 1971

TABLE 1d
COMPLIANCE SUMMARY - EFFLUENT STIPULATION

Outfall No.	Date 1971	Suspended Solids (mg/l)	Chloride (mg/l)	Oil (mg/l)	Violation*
Pennwalt Corp. -					
West Plant					
Intake	6/21	10	29		
(PCE-I)	6/22	11	41		
	6/23	15	30		
	6/24	9	42		
	Avg.	11	36		
W19	6/21	10	32		
	6/22	NF	NF		
	6/23	13	36		
	6/24	12	32		
	Avg.	12	33		
		(lbs/day)	(lbs/day)		
Net Waste-	6/21	0	170		
load	6/22	-	-		
(1963 Flow)	6/23	(0)	340		
	6/24	170	(0)		
	Avg.	57	170		
Net Waste-	6/21	0	140		
load	6/22	-	-		
(1971 Flow**)	6/23	(0)	290		
	6/24	140	(0)		
	Avg.	47	160		
Stipulation*		50 mg/l	8,800		

* Result of company operations - net
** Based on company monthly flow avg. for May 1971

TABLE 2
RIVER GRAB SAMPLE ANALYSIS RESULTS

River Mile:		RIVER STATIONS 16					14			12			
	Date 1971	Feet from Shore 15	100	600	1000	CWWI	100	400	700	15	122	490	880
Lab No's.	6/21	26060	26061	26062	26063	26064	26065	26066	26067	26068	26069	26070	26071
	6/22	26142	26143	26144	26145	26146	26147	26148	26149	26150	26151	26152	26153
	6/23	26260	26261	26262	26263	26264	26265	26266	26267	26268	26269	26270	26271
	6/24	26360	26361	26362	26363	26364	26365	26366	26367	26368	26369	26370	26371
Temperature-°C	6/21	20.5	20.5	20.0	20.5	20.0	20.5	20.5	20.0	20.5	20.5	20.0	20.5
	6/22	20.5	20.0	19.5	20.5	20.5	20.5	20.0	20.5	21.0	20.5	20.5	22.5
	6/23	20.5	20.5	20.5	20.5	20.5	21.0	20.5	20.5	20.5	20.5	20.5	21.5
	6/24	21.5	21.0	21.0	21.5	21.5	21.5	21.0	21.0	21.5	21.5	21.0	22.5
	Avg.	20.5	20.5	20.0	20.5	20.5	21.0	20.5	20.5	21.0	20.5	20.5	22.0
pH	6/21	8.0	8.1	8.2	8.6	8.4	8.2	8.2	8.4	8.4	8.2	8.3	8.2
	6/22	8.0	8.4	8.4	8.7	8.5	8.2	8.3	8.5	8.4	8.4	8.3	8.4
	6/23	7.5	8.0	8.5	8.6	8.2	8.2	8.5	8.5	8.5	8.5	8.4	8.5
	6/24	7.6	8.2	8.2	8.5	8.4	8.2	8.1	8.4	8.2	8.3	8.2	8.6
	Avg.	7.8	8.2	8.3	8.6	8.4	8.2	8.3	8.4	8.4	8.4	8.3	8.4
Conductivity umhos	6/21	240	230	230	220	220	230	220	220	320	280	260	230
	6/22	240	230	230	220	230	240	230	230	330	320	260	230
	6/23	240	240	230	230	220	240	230	230	310	270	250	230
	6/24	240	230	230	230	220	240	240	230	240	320	250	230
	Avg.	240	230	230	220	220	240	230	230	320	300	260	230
Susp. Solids mg/l	6/21	15	17	13	12	250	13	10	11	10	15	13	13
	6/22	14	11	12	7	13	11	15	6	13	20	9	12
	6/23	9	5	7	4	170	7	5	6	8	7	7	14
	6/24	11	11	8	7	8	8	7	9	6	7	11	9
	Avg.	12	11	10	8	110	10	9	8	9	12	10	12

TABLE 2 (cont'd)
RIVER GRAB SAMPLE ANALYSIS RESULTS

River Mile:		RIVER STATIONS 16					14			12			
	Date 1971	Feet from Shore 15	100	600	1000	CWWI	100	400	700	15	122	490	880
Chlorides mg/l	6/21	9	8	8	8	8	10	9	8	30	20	15	9
	6/22	10	8	9	8	8	11	9	8	31	30	17	11
	6/23	11	12	10	9	9	11	10	10	29	20	16	11
	6/24	11	11	10	10	8	11	10	10	38	34	17	10
	Avg.	10	10	9	9	8	11	10	9	32	26	16	10

TABLE 3
SAMPLE ANALYSES RESULTS

Station	Lab No.	Date 1971	Time	Temp.	pH	Conductivity (umhos)	Composite Samples: Chlorides (mg/l)	Composite Samples: Susp. Solids (mg/l)
BASF Wyandotte Corp.								
North Plant								
W27	26080	6/21	0945	30.5	6.9	550	54	28
			1140	31.0	6.7	520		
			1245	31.5	7.4	850		
	26180	6/22	0928	30.5	9.3	960	170	120
			1107	31.0	7.7	1,100		
			1220	31.0	7.1	1,200		
	26280	6/23	0911	30.5	8.1	800	63	28
			1033	31.0	8.1	550		
			1202	31.5	7.5	580		
	26380	6/24	0900	31.0	8.7	600	49	65
			1017	32.5	8.8	650		
			1114	32.5	8.8	650		
		Avg.		31.0	7.9	750	84	60
WCN-I	26081	6/21	0948	20.5	6.6	250	10	9
			1142	20.5	6.7	240		
			1246	20.5	6.8	240		
	26181	6/22	0945	20.5	8.0	260	11	11
			1108	20.5	8.0	240		
			1221	20.5	8.0	240		
	26281	6/23	0917	20.5	8.5	240	11	9
			1034	20.5	8.4	240		
			1207	20.5	8.5	240		
	26381	6/24	0905	21.5	8.5	240	11	9
			1020	21.5	8.2	240		
			1116	21.5	8.3	240		
		Avg.		20.5	7.9	240	11	10
South Plant								
WCS-I	26082	6/21	0957	20.5	6.8	250	12	11
			1150	20.5	7.0	240		
			1250	20.5	6.7	240		
	26182	6/22	0957	20.5	8.1	270	20	13
			1120	20.5	8.1	270		
			1226	20.5	8.0	270		
	26282	6/23	0925	20.5	8.8	270	20	14
			1040	20.5	8.7	270		
			1215	20.5	8.6	280		
	26382	6/24	0915	21.0	8.6	360	24	16
			1025	21.5	8.4	300		
			1121	21.5	8.4	300		
		Avg.		20.5	8.0	280	19	14

TABLE 3 (cont'd)
SAMPLE ANALYSES RESULTS

Station	Lab No.	Date 1971	Time	Temp.	pH	Conductivity (umhos)	Composite Samples Chlorides (mg/l)	Composite Samples Susp. Solids (mg/l)
South Plant								
W23	26083	6/21	1007	28.0	9.7	1,300	21	76
			1158	29.5	10.7	1,600		
			1252	28.0	10.5	1,200		
	26184	6/22	1000	27.0	12.0	>8,000	490	59
			1121	28.5	10.4	1,200		
			1228	29.5	10.4	1,200		
	26284	6/23	0928	29.5	11.0	2,300	420	84
			1045	29.5	10.9	1,900		
			1217	29.5	11.2	3,000		
	26384	6/24	0920	29.5	11.0	4,000	580	84
			1030	31.5	10.8	2,000		
			1126	31.5	10.8	2,000		
		Avg.		29.5	10.8	2,500	380	76
W21	26084	6/21	1017	25.5	7.4	330	35	20
			1202	26.5	7.3	330		
			1258	26.5	7.1	340		
	26186	6/22	1009	26.5	8.4	380	44	35
			1123	26.5	8.4	380		
			1230	26.5	8.3	380		
	26286	6/23	0938	24.5	9.1	370	40	26
			1050	23.5	9.1	370		
			1219	26.5	9.1	350		
	26386	6/24	0925	25.5	8.5	510	78	30
			1035	26.5	7.7	460		
			1131	27.5	7.9	420		
		Avg.		26.0	8.2	380	49	28
Pennwalt Corp.								
East Plant								
W17	26085	6/21	1025	32.5	8.5	1,800	40	34
			1204	29.5	9.7	1,500		
			1300	31.5	8.4	1,600		
	26187	6/22	1010	28.5	9.4	550	82	26
			1128	31.5	9.1	520		
			1233	30.5	8.6	560		
	26287	6/23	0940	29.0	9.0	500	69	26
			1055	31.0	8.5	480		
			1221	31.5	9.0	400		
	26387	6/24	0930	29.5	8.8	400	100	14
			1040	29.5	8.9	580		
			1136	37.5	8.7	750		
		Avg.		31.0	8.9	800	73	25

TABLE 3 (cont'd)
SAMPLE ANALYSES RESULTS

Station	Lab No.	Date 1971	Time	Temp.	pH	Conductivity (umhos)	Composite Samples: Chlorides (mg/l)	Composite Samples: Susp. Solids (mg/l)
East Plant								
W16	26086	6/21	1030	23.5	7.3	290	27	24
			1206	21.0	7.2	290		
			1301	21.0	7.3	320		
		6/22		N O	F L O W			
		6/23		"	"			
		6/24		"	"			
		Avg.		22.0	7.3	300		
W15	26087	6/21	1035	23.5	7.3	340	33	26
			1210	23.5	7.5	300		
			1302	24.0	7.3	320		
	26189	6/22	1020	24.5	8.5	340	41	29
			1130	24.5	8.4	340		
			1235	24.5	8.2	340		
		6/23		N O	F L O W			
		6/24		N O	F L O W			
		Avg.		24.0	7.9	330	37	28
PCE-1*	26088	6/21	1040	21.5	6.6	320	29	10
			1208	20.5	6.8	280		
			1303	20.5	7.0	300		
	26190	6/22	1018	20.5	8.5	340	41	11
			1129	20.5	8.5	300		
			1234	20.5	8.6	390		
	26288	6/23	0945	20.5	8.9	320	30	15
			1100	20.5	8.6	280		
			1223	21.0	8.7	340		
	26390	6/24	0935	21.5	8.5	340	42	9
			1045	21.5	8.6	380		
			1141	21.5	8.4	340		
		Avg.		21.0	8.1	330	36	11
W141	26089	6/21	1045	24.0	3.0	1,100	830	53
			1212	27.5	2.2	2,500		
			1304	26.5	2.5	1,800		
	26191	6/22	1025	25.0	9.6	1,100	240	58
			1131	26.5	9.7	1,000		
			1236	25.5	9.8	1,000		
	26289	6/23	0948	29.5	9.8	1,300	600	59
			1105	28.5	5.9	1,200		
			1225	30.5	8.8	1,200		

* Intake for East and West Plants.

TABLE 3 (cont'd)
SAMPLE ANALYSES RESULTS

Station	Lab No.	Date 1971	Time	Temp.	pH	Conductivity (umhos)	Composite Samples Chlorides (mg/l)	Composite Samples Susp. Solids (mg/l)
East Plant								
W141	26391	6/24	0940	29.5	6.8	1,200	720	57
			1050	29.5	6.5	950		
			1146	30.5	6.6	1,000		
		Avg.		28.0	6.8	1,300	600	57
W14	26090	6/21	1050	29.5	9.7	490	70	50
			1214	25.5	9.7	500		
			1307	29.0	9.7	520		
	26192	6/22	1030	29.5	9.9	550	65	53
			1133	29.5	10.0	540		
			1240	29.5	9.8	550		
	26290	6/23	0951	22.5	10.0	500	87	41
			1110	22.0	9.5	700		
			1227	22.0	9.8	440		
	26392	6/24	0945	25.5	9.8	500	720	69
			1055	26.0	8.8	1,100		
			1151	26.5	8.3	1,200		
		Avg.		26.5	9.6	630	240	53
West Plant								
W19	26091	6/21	1100	27.5	8.0	370	32	10
			1218	26.5	8.1	360		
			1312	26.5	8.3	380		
		6/22		N O	F L O W			
	26291	6/23	1005	27.5	8.4	350	36	13
			1115	27.5	7.3	350		
			1235	28.5	8.5	330		
	26393	6/24	0950	29.0	7.1	340	32	12
			1100	29.5	7.1	340		
			1156	30.5	7.5	340		
		Avg.		28.5	7.8	350	33	12

Table 4

Net Waste Loading Using 1963 Flows
(lbs/day)

Parameter	Date 1971	Outfall No.				Total
BASF Wyandotte Corp.						
North Plant		W27				
Chloride	6/21	18,000				
	6/22	64,000				
	6/23	21,000				
	6/24	15,000				
Avg.		30,000				
Suspended Solids	6/21	7,600				
	6/22	44,000				
	6/23	7,600				
	6/24	23,000				
Avg.		21,000				
South Plant		W23	W21*			
Chloride	6/21	22,000	42			22,000
	6/22	53,000	44			53,000
	6/23	45,000	37			45,000
	6/24	63,000	99			63,000
Avg.		46,000	56			46,000
Suspended Solids	6/21	7,300	16			7,300
	6/22	5,200	40			5,200
	6/23	7,900	22			7,900
	6/24	7,700	26			7,700
Avg.		7,000	26			7,000
Pennwalt Corp.						
East Plant		W21*	W17	W141*	W14	
Chloride	6/21	320	2,600	63,000	1,500	67,000
	6/22	160	9,800	16,000	860	27,000
	6/23	540	9,400	45,000	2,000	57,000
	6/24	1,900	14,000	54,000	24,000	94,000
Avg.		730	9,000	44,000	7,100	61,000

Table 4 (cont.)

Net Waste Loading Using 1963 Flows
(lbs/day)

Parameter	Date 1971	Outfall No.				Total
Pennwalt Corp.						
East Plant (cont.)		W21*	W17	W141*	W14	
Suspended Solids	6/21	540	5,800	3,400	1,400	11,000
	6/22	1,300	3,600	3,700	1,500	10,000
	6/23	590	2,600	3,500	940	7,600
	6/24	1,100	1,200	3,800	2,200	8,300
Avg.		880	3,300	3,600	1,500	9,200
West Plant						
Chloride	6/21	170				
	6/22	-				
	6/23	340				
	6/24	(0)				
Avg.		170				
Suspended Solids	6/21	0				
	6/22	-				
	6/23	(0)				
	6/24	170				
Avg.		57				

* Average Flow for May 1971.

Table 5

Net Waste Loading Using May 1971 Company Flow Average
(lbs/day)

Parameter	Date 1971	Outfall No.				Total
BASF - Wyandotte Corp.						
North Plant		W27				
Chloride	6/21	16,000				
	6/22	57,000				
	6/23	19,000				
	6/24	14,000				
Avg.		26,000				
Suspended Solids	6/21	6,800				
	6/22	39,000				
	6/23	6,800				
	6/24	20,000				
Avg.		18,000				
South Plant		W23	W21*			
Chloride	6/21	32,000	660			33,000
	6/22	76,000	690			77,000
	6/23	65,000	570			66,000
	6/24	90,000	1,500			92,000
Avg.		66,000	860			67,000
Suspended Solids	6/21	10,000	260			10,000
	6/22	7,400	630			8,000
	6/23	11,000	340			11,000
	6/24	11,000	400			11,000
Avg.		9,800	410			10,000
Pennwalt Corp.						
East Plant		W21*	W17	W141	W14	
Chloride	6/21	240	1,600	63,000	1,500	66,000
	6/22	120	5,800	16,000	880	23,000
	6/23	390	5,500	45,000	2,100	53,000
	6/24	1,400	8,200	54,000	25,000	89,000
Avg.		540	5,300	44,000	7,400	58,000

Table 5 (cont.)

Net Waste Loading Using May 1971 Company Flow Average
(lbs/day)

Parameter	Date 1971	Outfall No.				Total
Pennwalt Corp.						
East Plant (cont.)		W21*	W17	W141	W14	
Suspended Solids	6/21	390	3,400	3,400	1,500	8,700
	6/22	940	2,100	3,700	1,500	8,200
	6/23	430	1,600	3,500	950	6,500
	6/24	820	700	3,800	2,200	7,500
Avg.		640	2,000	3,600	1,500	7,700
West Plant		W19				
Chloride	6/21	140				
	6/22	-				
	6/23	290				
	6/24	(0)				
Avg.		160				
Suspended Solids	6/21	0				
	6/22	-				
	6/23	(0)				
	6/24	140				
Avg.		47				

* Both BASF Wyandotte and Pennwalt discharge thru W21. Net waste loads are based on reported company flows, concentrations measured at the outfall, and concentrations measured at separate intakes.

TABLE 6
OBSERVATION SUMMARY

Outfall	Times Observed	No. of Occurrences: Discoloration	Solids	Oil	Remarks
Pennwalt Corp.					
East Plant					
W14	14	8	4	5	light oil
W141	24	23	3	2	light oil
W17	13	4	1	-	odor - 1
West Plant					
W19*	6	1	2	-	
BASF Wyandotte Corp.					
South Plant					
W21	12	4	1	1	
W22	9	-	-	-	not flowing
W23	15	7	7	2	light oil
W24	9	2	1	-	not flowing
W26	7	-	-	-	submerged
North Plant					
W27	23	22	5	4	light oil
W29	4	2	-	-	inaccessible

* mouth of Monguagon Creek

Table 7

OBSERVATIONS

Outfall No.	Date 1971	Time	Adverse Effluent Descriptions and Visible Effect on River
W14	3/15	1415	Light brown.
	3/23	1430	
	3/24	1120	Light brown 25' offshore and 20' downstream.
	3/29	1000	
	6/2	1139	
	6/8	1019	Brown 20' - 30' offshore and 100' downstream.
	6/15	1130	Spots of oil, solids.
	6/16	1150	Gray, solids and light blue oil spots.
	6/17	1112	Gray-brown.
	6/18	1300	Yellow-green 20' offshore and 20' downstream, strong ammonia odor.
	6/21	1050	Light gray, light oil.
	6/22	1030	Gray.
	6/23	0951	Light oil.
	6/24	0945	Light gray solids, light oil, 35' offshore and 150' downstream.
W141	3/15	1422	Dark red 50' offshore and 400' downstream. Trace of silver-blue oil and scum.
	3/23	1441	Dark red-brown 30' offshore and 100' downstream.
	3/24	1125	Red 30' offshore and 60' downstream.
	3/29	0945	Red-orange 50' offshore and $\frac{1}{2}$ mile downstream.
	3/31	0820	Orange-red 20' offshore and $\frac{1}{4}$ mile downstream.
	4/1	0944	Red-yellow 50' offshore and 75' downstream.
		1020	Yellow-red 25' offshore and 200' downstream.
	4/7	0830	Rust colored 30' offshore.
	4/19	1005	
	4/21	0753	Red 50' offshore and 1000' downstream.
		1412	Red " " " " "
	4/22	1315	Red 40' offshore and 100' downstream.
	4/30	1129	Red-orange 20' offshore and 1000' downstream.
	6/2	1142	Red 20' offshore and 500' downstream.
	6/8	1024	Red solids, 40' offshore and 100' downstream.
	6/10	0956	Red-orange 20' offshore and 1000' downstream.
	6/15	1145	Red.
	6/16	1435	Red offshore 35', with red colored solids
	6/17	1105	Red 50' offshore, $\frac{1}{4}$ mile downstream with spots of iridescent oil.
	6/18	1040	Red offshore 70', downstream 200'.
	6/21	1045	Red offshore 50' and downstream 1000'.
	6/22	1025	Light red 35' offshore and 600' downstream.
	6/23	0948	Red 50' offshore and 300' downstream.
	6/24	0940	Red 40' " " 250' "

Table 7 (cont.)

OBSERVATIONS

Outfall No.	Date 1971	Time	Adverse Effluent Descriptions and Visible Effect on River
W17	3/15	-	
	3/23	1442	
		1446	Chlorine odor.
	3/24	1145	
	6/2	1222	Gray, 15' offshore and 20' downstream.
	6/8	1035	
	6/15	1200	
	6/16	1410	
	6/17	1047	Light gray.
	6/21	1025	Light gray 50' offshore and downstream 300'.
	6/22	1010	
	6/23	0940	Light gray 30' offshore and downstream 100'.
	6/24	0930	Solids, 30' offshore and downstream 100'.
W19*	6/2	1122	
	6/15	1105	
	6/16	1130	
	6/21	1100	Gray.
	6/23	1005	Solids and light oil.
	6/24	0950	Solids.
W21	3/15	1445	Yellow-gray.
	3/23	1443	Light orange.
	3/24	1155	Trace of silver-gray oil with solids
	6/2	1226	
	6/8	1040	Light yellow.
	6/15	1215	
	6/16	1205	
	6/17	1042	
	6/21	1017	Gray.
	6/22	1009	
	6/23	0938	
	6/24	0925	
W22	3/15	1453	
	3/24	1303	
	6/2	-	
	6/8	1045	
	6/15	1230	
	6/16	1230	
	6/17	1041	
	6/18	1220	
	6/21	1010	

* mouth of Monguagon Creek

Table 7 (cont.)

OBSERVATIONS

Outfall No.	Date 1971	Time	Adverse Effluent Descriptions and Visible Effect on River
W23	3/15	1456	
	3/23	1444	
	3/24	1310	
	3/31	0835	Steaming.
	4/19	1010	White scum.
	6/2	1230	
	6/8	1047	Scum 20' offshore and 200' downstream, 10% coverage by iridescent oil film.
	6/15	1250	
	6/16	1245	Light gray, small solids 10' offshore and 30' downstream.
	6/17	1037	Brown 20' offshore and 100' downstream, light solids.
	6/18	1217	Yellow-white 20' offshore and 50' downstream, solids.
	6/21	1007	Light gray with white solids 20' offshore and 200' downstream.
	6/22	1000	Light gray with solids 50' offshore and 200' downstream
	6/23	0928	Solids and light oil.
	6/24	0920	Light gray with solids 20' offshore and 150' downstream.
W24	3/15	1501	
	3/23	1445	
	3/24	1322	
	6/2	1233	
	6/15	1310	
	6/16	1300	White with fine solids, 2' offshore and 6' downstream.
	6/17	1028	White 20' offshore and 20' downstream.
	6/18	1215	
	6/21	1000	
W26	3/15	1518	
	3/24	1332	
	6/2	1240	
	6/15	1215	
	6/16	1315	
	6/17	1021	
	6/18	1210	
W27	3/24	1344	White, 50' offshore and 100' downstream
	3/29	1020	Brown-white scum and iridescent oil 20' offshore and 500' downstream.
	3/30	-	
	3/31	0830	White scum 25' offshore and 500' downstream.

Table 7 (cont.)

OBSERVATIONS

Outfall No.	Date 1971	Time	Adverse Effluent Descriptions and Visible Effect on River
W27 (cont.)	4/1	0956	Gray-brown 75' offshore and 100' downstream.
		1440	White oily material 100' offshore and 300' downstream.
	4/8	0900	Yellow foam 50' offshore and 50' downstream.
		1515	Yellow-green foam 50' offshore and 100' downstream.
	4/12	0931	Yellow-white 60' offshore and 150' downstream.
	4/21	0800	White 50' offshore and 300' downstream.
		1403	" " " " " "
	4/30	1427	" 75' " " 100' "
	6/2	1311	Gray 50' offshore and 100' downstream.
	6/8	1100	White 20' offshore and 50' downstream.
		1420	Yellow 20' offshore and 60' downstream.
	6/15	1335	White.
	6/16	1345	White with fine solids 75' offshore and 250' downstream, blue oil spots.
	6/17	0959	White with yellow scum 100' offshore and 200' downstream.
	6/18	1154	Creamy white foam 100' offshore and 500' downstream.
	6/21	0945	Gray-green with white solids 5' offshore and 100' downstream.
	6/22	0928	Yellow with off-white solids 75' offshore and 500' downstream.
	6/23	0911	White with solids 50' offshore and 250' downstream, light oil.
	6/24	0900	White with solids 50' offshore and 250' downstream.
W29	3/24	1437	
	3/29	1032	Turbid.
	6/15	1415	
	6/18	1150	Slightly turbid and yellow.

TABLE 8
AUTOMATIC MONITORING RESULTS

Detroit River, Riverview Boat Ramp
(River Mile 12.02)

Date 1971	Monitoring Interval	Temp. °F	Dissolved Oxygen mg/l	Conductivity umhos
6/21	1020-1400	Max.: 78°	9.8	280
		Min.: 77°	9.0	275
		Avg.: 78°	9.4	275
6/22	1000-1410	Max.: 75°	10.6	280
		Min.: 69°	9.0	220
		Avg.: 71°	9.2	275
6/23	0900-1400	Max.: 71°	8.2	240
		Min.: 69°	6.8	210
		Avg.: 70°	7.5	225
6/24	0900-1330	Max.: 74°	12.0	320
		Min.: 70°	8.2	180
		Avg.: 72°	10.1	300

A P P E N D I X A

EFFLUENT STIPULATIONS

APPENDIX A

Michigan Water Resources Commission
Effluent Stipulations

The companies are restricted by stipulations with the Michigan Water Resources Commission, which requires the following:

BASF Wyandotte Corp.

A. North Plant

1. Treat or control its industrial wastes from its North Plant to the extent necessary that when discharged to the Detroit River they shall:

   a. not contain suspended solids in a concentration greater than fifty (50) milligrams per liter above that present in the company's source of water supply.

   b. not add more than 1,300,000 pounds per day of chlorides, as Cl, as a result of company operations.

   c. not contain oil in concentrations greater than fifteen (15) milligrams per liter or in amounts sufficient to create a visible film on the surface waters of the State.

B. South Plant

1. Treat or control its industrial wastes from its South Plant to the extent necessary that when discharged to the Detroit River they shall:

   a. not contain suspended solids in a concentration greater than fifty (50) milligrams per liter above that present in the company's source of water supply.

   b. not add more than 550,000 pounds per day of chlorides, as Cl, as a result of company operations.

   c. not contain oil in concentrations greater than fifteen (15) milligrams per liter or in amounts sufficient to create a visible film on the surface waters of the State.

Pennwalt Corp.

A. East Plant

1. Treat or control its industrial wastes from its East Plant to the extent necessary that when discharged to the Detroit River they shall:

   a. not contain suspended solids in a concentration greater than fifty (50) milligrams per liter above that present in the company's source of water supply.

   b. not add more than 500,000 pounds per day of chlorides, as Cl, as a result of company operations.

B. West Plant

1. Treat or control its industrial wastes from its West Plant to the extent necessary that when discharged to the Detroit River and its tributaries they shall:

   a. not contain suspended solids in a concentration greater than fifty (50) milligrams per liter above that present in the company's source of water supply.

   b. not add more than 8,800 pounds per day of chlorides, as Cl, as a result of company operations.

A P P E N D I X B

MICHIGAN INTRASTATE
WATER QUALITY STANDARDS

COMMISSION OBJECTIVE:
WATERS IN WHICH THE EXISTING QUALITY IS [illegible] THAN THE ESTABLISHED STANDARDS AS OF THE DATE SUCH STANDARDS BECOME EFFECTIVE WILL NOT BE LOWERED IN QUALITY BY ACTION OF THE WATER RESOURCES COMMISSION UNLESS AND UNTIL IT HAS BEEN AFFIRMATIVELY DEMONSTRATED THAT THE CHANGE IN QUALITY WILL NOT BECOME INJURIOUS TO THE PUBLIC HEALTH, SAFETY, OR WELFARE; OR BECOME INJURIOUS TO DOMESTIC, COMMERCIAL, INDUSTRIAL, AGRICULTURAL, RECREATIONAL OR OTHER USES WHICH ARE BEING MADE OF SUCH WATERS; OR BECOME INJURIOUS TO THE VALUE OR UTILITY OF RIPARIAN LANDS; OR BECOME INJURIOUS TO LIVESTOCK, WILD ANIMALS, BIRDS, FISH, AQUATIC LIFE OR PLANTS, OR THE GROWTH OR PROPAGATION THEREOF BE PREVENTED OR INJURIOUSLY AFFECTED; OR WHEREBY THE VALUE OF FISH AND GAME MAY BE DESTROYED OR IMPAIRED.
WATER WHICH DOES NOT MEET THE STANDARDS WILL BE IMPROVED IN QUALITY TO MEET THE STANDARDS.

WATER USES / PARAMETERS	1 COLIFORM GROUP (organisms/100ml or MPN)	2 DISSOLVED OXYGEN (mg/l)	3 SUSPENDED, COLLOIDAL & SETTLEABLE MATERIALS	4 RESIDUES (Debris and material of unnatural origin and oils)	5 TOXIC & DELETERIOUS SUBSTANCES
A WATER SUPPLY (I.) DOMESTIC — Such as drinking, culinary and food processing.	For Great Lakes & Connecting Waters: The monthly average shall not exceed 2000 nor shall 20% of the samples examined exceed 2000. For inland Waters: The monthly average shall not exceed 5000 nor shall 20% of the samples examined exceed 5000, nor exceed 20,000 in more than 5% of the samples.	Present at all times in sufficient quantities to prevent nuisance.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use	Floating Solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Conform to current USPHS Drinking Water Standards except: Cyanide: Normally not detectable with a maximum upper limit of 0.2 mg/l. Chromium: Normally not detectable with a maximum upper limit of 0.05 mg/l. Phenol: Limitations as defined under A-8.
(2.) INDUSTRIAL — Such as cooling and manufacturing process.	The average of any series of 10 consecutive samples shall not exceed 5000 nor shall 20% of the samples examined exceed 10,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 1000.	Present at all times in sufficient quantities to prevent nuisance.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Limited to concentrations less than those which are or may become injurious to the designated use.
B RECREATION (I.) TOTAL BODY CONTACT — Such as swimming, water skiing and skin diving.	The average of any series of 10 consecutive samples shall not exceed 1000 nor shall 20% of the samples examined exceed 5,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 100. See Appendix A, Section B.	Present at all times in sufficient quantities to prevent nuisance.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Limited to concentrations less than those which are or may become injurious to the designated use.
(2.) PARTIAL BODY CONTACT — Such as fishing, hunting, trapping and boating.	The average of any series of 10 consecutive samples shall not exceed 5000 nor shall 20% of the samples examined exceed 10,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 1000. See Appendix A, Section B.	Present at all times in sufficient quantities to prevent nuisance.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Limited to concentrations less than those which are or may become injurious to the designated use.
C FISH, WILDLIFE AND OTHER AQUATIC LIFE such as (growth and propagation)	The average of any series of 10 consecutive samples shall not exceed 5000 nor shall 20% of the samples examined exceed 10,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 1000.	At the average low river flow of 7-day duration expected to occur once in 10 years the following DO values shall be maintained for: Intolerant fish - cold water species: Not less than 6 at any time. Intolerant fish - warm water species: Average daily DO not less than 5, nor shall any single value be less than 4. Tolerant fish - warm water species: Average daily DO not less than 4, nor shall any single value be less than 3. At greater flows the DO shall be in excess of these values.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Not to exceed 1/10 of the 96-hour median tolerance limit obtained from continuous flow bio-assays where the dilution water and toxicant are continuously renewed except that other application factors may be used in specific cases when justified on the basis of available evidence and approved by the appropriate agency.
D AGRICULTURAL — Such as livestock watering, irrigation and spraying.	The average of any series of 10 consecutive samples shall not exceed 5000 nor shall 20% of the samples examined exceed 10,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 1000.	Not less than 3 at any time.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease.	Conform to current USPHS Drinking Water Standards as related to toxicants. Toxic and deleterious substances shall be less than those which are or may become injurious to the designated use.
E COMMERCIAL — Such as navigation, hydroelectric and steam generated electric power	The average of any series of 10 consecutive samples shall not exceed 5000 nor shall 20% of the samples examined exceed 10,000. The average fecal coliform density for the same 10 consecutive samples shall not exceed 1000.	Present at all times in sufficient quantities to prevent nuisance.	No objectionable unnatural turbidity, color, or deposits in quantities sufficient to interfere with the designated use.	Floating solids: None of unnatural origin. Residues: No evidence of such material except of natural origin. No visible film of oil, gasoline or related materials. No globules of grease	Limited to concentrations less than those which are or may become injurious to the designated use

QUALITY STANDARDS

6 TOTAL DISSOLVED SOLIDS (mg/l)	7 NUTRIENTS Phosphorus, ammonia, nitrates and sugars	8 TASTE & ODOR PRODUCING SUBSTANCES	9 TEMPERATURE* (°F)	10 HYDROGEN ION (pH)	11 RADIOACTIVE MATERIALS
FOR GREAT LAKES & CONNECTING WATERS: Total Dissolved Solids: The maximum shall not exceed 200. Chlorides: The monthly average shall not exceed 50. A monthly average of 10 is a desirable limit where existing conditions are less than 10. FOR INLAND WATERS: Total Dissolved Solids: Shall not exceed 500 as a monthly average, nor exceed 750 at any time. Chlorides: The monthly average shall not exceed 125.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent adverse effects on water treatment processes or the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use. Monthly average phenol concentration less than 0.002 mg/l - maximum concentration limited to 0.005 mg/l for a single sample.	The maximum natural water temperature shall not be increased by more than 100F.	pH shall not have an induced variation of more than 0.5 unit as a result of unnatural sources	An upper limit of 1000 picocuries/liter of gross beta activity (in absence of alpha emitters and Strontium-90) If this limit is exceeded the specific radionuclides present must be identified by complete analysis in order to establish the fact that the concentration of nuclides will not produce exposures above the recommended limits established by the Federal Radiation Council
Total Dissolved solids: Shall not exceed 500 as a monthly average nor exceed 750 at any time. Chlorides: The monthly average shall not exceed 125.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use.	The maximum natural water temperature shall not be increased by more than 100F.	Maintained within the range 6.5-8.8 with a maximum induced variation of 0.5 unit within this range.	Standards to be established when information becomes available on deleterious effects.
Limited to concentrations less than those which are or may become injurious to the designated use.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use.	90°F maximum	Maintained within the range 6.5-8.8 with a maximum induced variation of 0.5 unit within this range	Standards to be established when information becomes available on deleterious effects.
Limited to concentrations less than those which are or may become injurious to the designated use.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use.	90°F maximum	Maintained within the range 6.5-8.8 with a maximum induced variation of 0.5 unit within this range.	Standards to be established when information becomes available on deleterious effects
Standards to be established when information becomes available on deleterious effects.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are causing or may cause taint in the flesh of fish or game.	Intolerant fish - cold water species: Ambient 32° to nat. max.; Allowable increase 10°; Maximum limit 70° Intolerant fish - warm water species: Ambient 32° to 35° / 36° to nat. max.; Allowable increase 15° / 10°; Maximum limit 85° Tolerant fish - warm water species: Ambient 32° to 59° / 60° to nat. max.; Allowable increase 15° / 10°; Maximum limit 87°	Maintained between 6.5 and 8.8 with a maximum artificially induced variation of 1.0 unit within this range. Changes in the pH of natural waters outside these values must be toward neutrality (7.0).	Standards to be established when information becomes available on deleterious effects.
Less than 700 dissolved minerals. Maximum percentage of sodium 40% as determined by the formula $\frac{(Na \times 100)}{(Na+Ca+Mg+k)}$ when the bases are expressed as milliequivalents per liter.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use. NO_3 concentrations shall conform to USPHS Drinking Water Standards.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use.	Not applicable	pH shall not have an induced variation of more than 0.5 unit as a result of unnatural sources.	An upper limit of 1000 picocuries/liter of gross beta activity (in absence of alpha emitters and Strontium-90) If this limit is exceeded the specific radionuclides present must be identified by complete analysis in order to establish the fact that the concentration of nuclides will not produce exposures above the recommended limits established by the Federal Radiation Council
Limited to concentrations less than those which are or may become injurious to the designated use.	Nutrients originating from industrial, municipal, or domestic animal sources shall be limited to the extent necessary to prevent the stimulation of growths of algae, weeds and slimes which are or may become injurious to the designated use.	Concentrations of substances of unnatural origin shall be less than those which are or may become injurious to the designated use	The maximum natural water temperature shall not be increased by more than 100F.	Maintained within the range 6.5-8.8 with a maximum induced variation of 0.5 unit within this range.	Standards to be established when information becomes available on deleterious effects

* For the Great Lakes and connecting waters no heat load in sufficient quantity to create conditions which are or may become injurious to the public health, safety or welfare; or which are or may become injurious to domestic, commercial, industrial, agricultural, recreational or other uses which are being or may be made of such waters; or which are or may become injurious to the value or utility of riparian lands; or which are or may become injurious to livestock, wild animals, birds, fish or aquatic life or the growth or propagation thereof.

ADDENDUM NO. 1

BASF-Wyandotte Corporation, North and South Plants
Pennwalt Corporation, East Plant
Detroit Edison Company, Wyandotte Plant

Observations were made and grab samples collected of waste effluent on the Detroit River between July 22 and October 15, 1971. The sampling and laboratory methods used were the same as used in previous surveys. The data are listed in the following tables:

Table No.	Title
1	Sample Analysis Results and Waste Loadings BASF-Wyandotte Corp. North Plant
2	Laboratory Observations of Samples BASF-Wyandotte Corp. North Plant
3	Sample Analysis Results and Wasteloads Pennwalt Corp. East Plant
4	Laboratory Observations of Samples Pennwalt Corp. East Plant
5	Sample Analysis Results City of Wyandotte Water Intake
6	Sample Analysis Results Detroit River Stations
7	Effluent Observations

Sampling points not previously described are as follows:

Station No.	Detroit River	Description
R66		River mile 3.9, 2500 ft. from U.S. shore
R91		" " 8.7, 80 ft. from U.S. shore
R145		" " 9.6, 100 ft. from U.S. shore
R86		" " 12.0, 122 ft. from U.S. shore
R33		" " 14.6, 100 ft. from U.S. shore
R17		" " 17.9, 100 ft. from U.S. shore
R139		" " 19.0, 100 ft. from U.S. shore
R4		" " 20.6, 100 ft. from U.S. shore
Outfall W78		Detroit Edison outfall, 18-inch circular pipe in breakwall, at the BASF-Wyandotte Corp. North Plant.

The Detroit River sampling stations are shown on Figure 1.

Conclusions

BASF-Wyandotte Corp. North Plant

Net suspended solids concentrations at W27 averaged 8 mg/l based on four grab samples in October 1971, compared to 50 mg/l in June 1971. Flow was estimated to be 41 MGD. Oil spots were observed discharging on 10/6/71.

BASF-Wyandotte Corp. South Plant

Outfall W23 was sampled on 7/23 and 10/6/71 and mercury analysis performed with concentrations of 4.4 and 0.25 ug/l respectively. This compares to 2.2 ug/l determined in November 1970. The mercury cell which discharged through W23 was shut down on March 31, 1971.

Pennwalt Corporation - East Plant

Net average suspended solid concentration at W141 was 17 mg/l compared to 46 mg/l determined in June. Total iron at W141 was found to be excessive on the two days sampled with net concentrations of 10 and 5.1 mg/l. The effluent from W141 discolored the river with orange suspended material up to 100 ft. offshore and 1000 ft. downstream for most of the period between March 15 and October 7, 1971.

In addition to the preplanned surveys at the Pennwalt Chemical Corp. East Plant, a MIDO field crew, Messrs. Powers and McCue, observed W141 flowing on 9/22/71 during a routine observation run. The red-yellow discharge was visible 100 ft. offshore and 2000 ft. downstream.

Samples were collected from the discharge boil and from a point 200 ft. offshore in the Detroit River out of the effluent influence. The sample analysis results are as follows:

Station No.	Date	Time	Lab. No.	Analysis Results: Total Iron (ug/l)	Analysis Results: Suspended Solids (mg/l)
W141	9/22/71	1507	39762	10,000	34
Detroit River	"	1508	39763	580	14

The discoloration caused by the discharge is a violation of the Interstate Water Quality Standards and the Objectives of the Detroit River-Lake Erie Enforcement Conference. The iron discharge appears excessive.

Detroit Edison Company - Wyandotte Plant

The Detroit Edison fly ash lagoon outlet W38 was sampled 4 times in October. Net suspended solids concentrations averaged 25 mg/l with net average loading of 560 lbs/day (based on 2.7 MGD flow estimate). Observations revealed visible white suspended material and foam being discharged during the 4 days sampled.

TABLE 1
Outfall Analysis Results
BASF-Wyandotte Corp. North Plant
Detroit Edison Co. Wyandotte Plant

	Date 1971	W78*	W27	Intake WCN-I
Laboratory No.	10/6	41318	41316	41317
	10/7	41356	41357	41358
	10/8	41409	41408	41410
	10/15	42400	42401	42402
Suspended Solids (mg/l)	10/6	36	16	12
	10/7	31	17	14
	10/8	31	17	11
	10/15	49	32	9
Average		37	20	12

*Detroit Edison-Fly ash lagoon outlet.

	Waste Loadings (lbs/day)		
		W78a	W27a
Suspended Solids	10/6	530	1400
	10/7	370	1000
	10/8	440	2000
	10/15	880	7800

a - based on MIDO October survey:
W78 - 2.7 MGD
W27 - 41 MGD

TABLE 2
Laboratory Observations of Samples
BASF-Wyandotte Corp. North Plant
Detroit Edison Co. Wyandotte Plant

Station No.	Date 1971	Lab. No.	Description
W78	10/6	41318	a - lt. amt. gray; d - chemical
	10/7	41356	a - lt. amt. brown
	10/8	41409	a - lt. amt. brown
	10/15	42400	
W27	10/6	41316	b - lt. film; d - chemical
	10/7	41357	
	10/8	41408	b - trace; d - musty
	10/15	42401	a - lt amt. yellow; d - chemical
Intake WCN-I	10/6	41317	b - trace
	10/7	41358	a - lt. amt. brown
	10/8	41410	
	10/15	42402	a - lt amt. orange

a - solids
b - oil
c - color
d - odor

TABLE 3
Sample Analysis Results and Wasteloads
Pennwalt Corp. East Plant

	Concentrations				Wasteloads (#/day)	
	Date 1971	W14	W141	Intake	W14*	W141**
Laboratory No.	10/6	41311	41312	41313		
	10/7	NS	41361	41362		
	10/8	NS	41403	41404		
	10/15	NS	42406	42407		
Susp. Solids (mg/l)	10/6	18	35	18	0	1300
	10/7	NS	22	9	NS	1000
	10/8	NS	38	12	NS	2000
	10/15	NS	20	7	NS	1000
Avg.			29	12		
Total Iron (ug/l)	10/6	NS	11,000	900	NS	790
	10/15	NS	5,900	810	NS	400
Diss. Iron (ug/l)	10/6	NS	< 20	< 20	NS	0
Susp. Iron (ug/l)	10/6	NS	11,000	900	NS	790
pH	10/6	NS	6.6	8.4		

NS - no sample
* Based on company flows of May 1971, W14-4.4 MGD
** " " " " " " " W141 - 9.5 MGD

TABLE 4
LABORATORY OBSERVATIONS OF SAMPLES
PENNWALT CORPORATION EAST PLANT

Station No.	1971 Date	Lab. No.	Odor	Color	Oil	Solids
W14	10/6	41311	chemical		lt. film	
W141	10/6	41312	chemical	orange		med. amt. orange
	10/7	41361		lt. yellow		med. amt. red-brown ppt
	10/8	41403	chemical	yellow		med. amt. orange
	10/15	42406	chemical	yellow		lt. yellow orange
Intake	10/6	41313				
	10/7	41362			trace	
	10/8	41404	slight chemical			
	10/15	41407				

TABLE 5
SAMPLE ANALYSIS RESULTS
CITY OF WYANDOTTE WATER INTAKE

	Date 1971	CWWI
Laboratory No.	10/8	41407
	10/13	42213
	10/15	42405
	10/27	44200
	10/28	44300
Phenol - ug/l	10/13	1
	10/27	3
Susp. Solids - mg/l	10/8	10
	10/13	7
	10/15	8
	10/27	18
	10/28	10
	Avg.	11
Oil - mg/l	10/13	4
	10/27	6
	10/28	5
	Avg.	5
Cyanide - mg/l	10/8	<.01
	10/13	<.01
	10/15	<.01
	Avg.	<.01
Total Iron - ug/l	10/13	400
	10/27	470
	10/28	340
	Avg.	400
Diss. Iron - ug/l	10/13	50
	10/27	30
	10/28	<20
	Avg.	30
Susp. Iron - ug/l	10/13	350
	10/27	440
	10/28	340
	Avg.	380

TABLE 6
Sample Analysis Results
Detroit River Stations
1971

	Date	R66	R91	R145	R86	R33	R17	R139	R4
Laboratory No.	10/5	NS	NS	NS	NS	NS	NS	41115	41114
	10/6	41300	41301	41302	41303	41304	41305	41306	NS
Phenol - ug/l	10/5							2	1
Susp. Solids - mg/l	10/5							8	8
	10/6		19					10	
Oil - mg/l	10/5							6	5
Total Iron - ug/l	10/5							450	310
	10/6	1100	840	1400	1000	720	2300	420	
Diss. Iron - ug/l	10/5							20	20
	10/6	40	30	20	30	20	200	20	
Susp. Iron - ug/l	10/5							430	290
	10/6	1100	810	1400	1000	700	2100	400	
pH	10/5							8.4	8.5
Cyanide - mg/l	10/5							.01	.01
	10/6			.01	<.01				

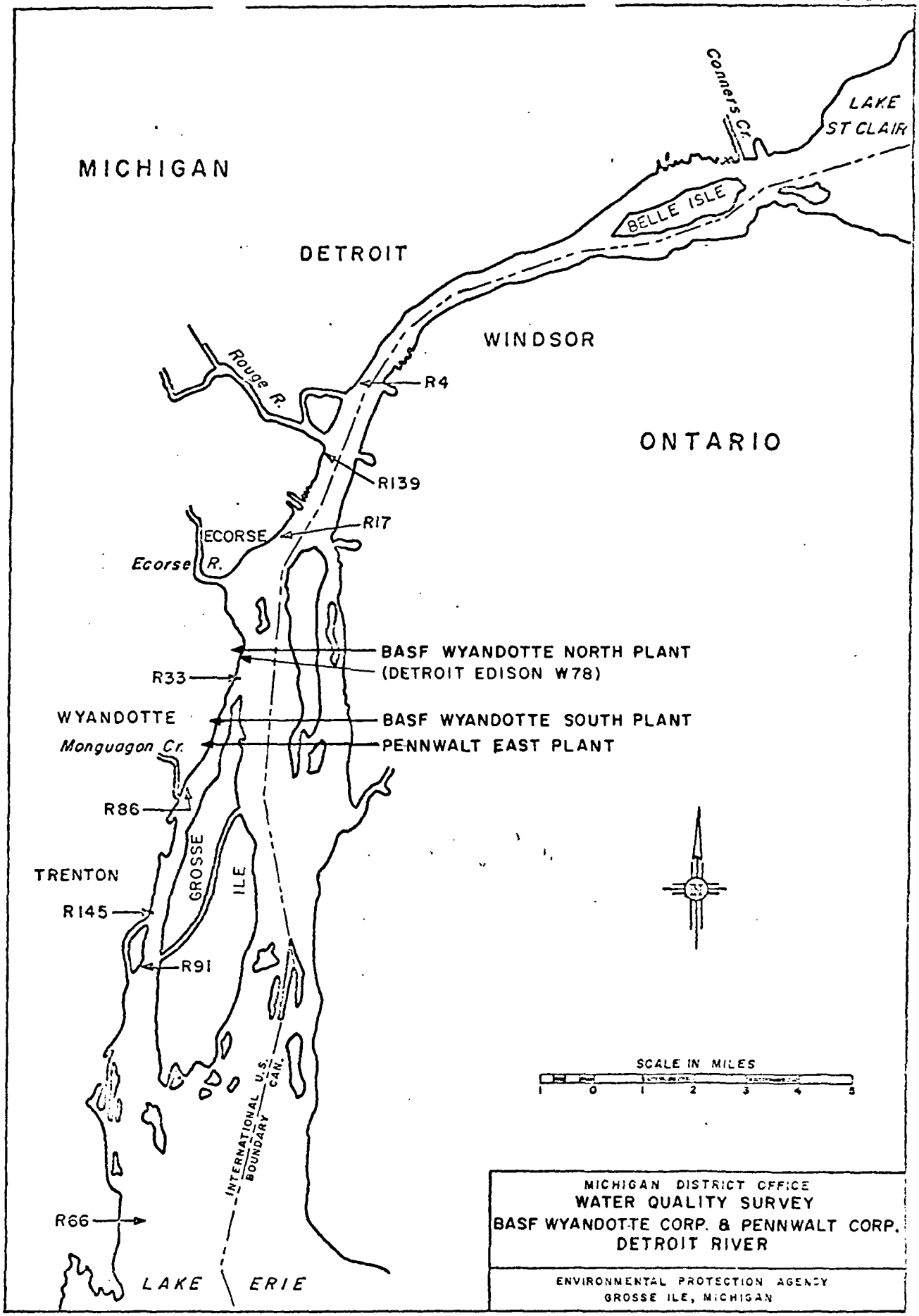
NS - no sample

TABLE 7

Effluent Observations

Outfall No.	Date 1971	Time	Adverse Effluent Descriptions and Visible Effect on River
Pennwalt Corp. - East Plant			
W14	7/27	1100	
	8/26	1405	
	9/9	1210	gray
W141	7/22	1120	red, 50' offshore and 300' downstream
	8/2	0937	yellow, small solids, chlorine odor
	8/10	0917	red in area 30' around outfall
	8/26	1403	orange, 30' offshore and 1000' downstream
	9/9	1200	orange, 35' offshore & 400' downstream, solids
	9/9	1215	gray, 1/8" solids
	9/22	1507	red-yellow, 100' offshore and 2000' downstream
	10/6	1155	orange, 50' offshore and 200' downstream, heavy suspended solids
	10/7	1300	orange, 50' offshore, heavy suspended solids
W17	7/22	1127	
	8/26	1357	
	9/9	1400	gray
BASF-Wyandotte Corp. - South Plant			
W23	10/6	1210	brown suspended solids, gray-brown foam, 30' offshore and 150' downstream
Detroit Edison Co. - Wyandotte Plant			
W78	10/6	1305	white suspended solids, 25' offshore and 25' downstream
	10/7	1145	gray, white suspended solids and foam, 10' offshore and 25' downstream
	10/8	1220	lt. gray, foam 25' offshore and 20' upstream
	10/15	0952	dark gray, solids, white foam, 30' offshore and 125' downstream.
BASF-Wyandotte Corp. - North Plant			
W27	10/6	1240	brown, lt. blue $\frac{1}{2}$" oil spots, white foam, 60' offshore and 75' downstream
	10/7	1205	brown-green, yellow foam, brown suspended solids, 70' offshore and 200' downstream
	10/8	1240	gray, white foam, 60' offshore & 25' upstream
	10/15	1010	green-brown, white foam, suspended solids, 75' offshore & 200' downstream.

FIGURE 1


MICHIGAN
Conners Ck.
LAKE ST CLAIR
BELLE ISLE
DETROIT
WINDSOR
Rouge R.
R4
ONTARIO
R139
R17
ECORSE
Ecorse R.
BASF WYANDOTTE NORTH PLANT
(DETROIT EDISON W78)
R33
WYANDOTTE
BASF WYANDOTTE SOUTH PLANT
Monguagon Cr.
PENNWALT EAST PLANT
R86
GROSSE ILE
TRENTON
R145
R91
INTERNATIONAL BOUNDARY U.S. CAN.
R66
LAKE ERIE
SCALE IN MILES
1 0 1 2 3 4 5
MICHIGAN DISTRICT OFFICE
WATER QUALITY SURVEY
BASF WYANDOTTE CORP. & PENNWALT CORP.
DETROIT RIVER
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN

REPORT OF SURVEY

Pennsalt Chemicals Corporation
4655 Biddle
Wyandotte, Michigan

East Plant

Organization of Survey

Flow measurements, samples and pertinent plant data were obtained by the staff of the Michigan Water Resources Commission.

Analytical determinations were made at the Grosse Ile and Chicago Laboratories of the United States Public Health Service.

Dates of Survey

Survey #1 - 2:30 p.m. March 26 to 2:30 p.m. March 27, 1963

Survey #2 - 2:30 p.m. March 27 to 2:30 p.m. March 28, 1963

Purpose of the Survey

This survey was conducted to obtain current wastes data and information for the Detroit River-Lake Erie Project Survey being conducted by the United States Public Health Service.

Personnel Participating

Pennsalt Chemicals Corporation

Dr. Gillette, Research and Technical Director

Mr. K. Beyer, Chief Chemist

Mr. Van Russell, Process Engineer

Michigan Water Resources Commission

G. Calhoun, District Sanitary Engineer

W. Dennlston, Sanitary Engineer

J. Pope, Water Pollution Investigator

E. Stolnicki, General Foreman

U. S. Public Health Service

D. Krawczyk, Chief Chemist

Members of Laboratory Staff

Location of Plant

The East Plant of Pennsalt Chemicals Corporation is located on the east side of Biddle Street, lying partially in Riverview and the South edge of Wyandotte, extending north to Wye Street.

Employees

Approximately 1,100 persons are employed at this plant.

Operations

The plant operates 24-hours per day seven days per week.

Raw Materials

Raw materials used in process are:

Brine	Limestone
Air	Iron
Coal	Sand
Soda Ash	

Quantities used were not disclosed.

Production

The principle products manufactured at this plant are:

a. Chlorine

b. Calcium Hypochlorite

c. Caustic

d. Hydrogen peroxide

e. Ammonium chloride

f. Ammonia

g. Hydrochloric acid

h. Ferric chloride

i. Sodium Ortho Silicate

Quantities produced were not disclosed.

Water Supply

Wyandotte municipal water is used for drinking and sanitary purposes. The Company maintains two water intakes on the Trenton Channel for processing and cooling purposes.

Sanitary Wastes

Sanitary wastes are collected in a separate sewer system and discharged to the Wayne County Road Commission Sewerage System (Wyandotte Plant).

Process Wastes

Process wastes are discharged through 6 outfall lines to the Trenton Channel. No formal treatment facilities are provided.

Manufacturing Process

This plant is a heavy chemical manufacturing facility utilizing salt brine as the primary raw material. Products manufactured are: Chlorine and caustic soda by the electrolytic process; Hydrochloric acid by electrolytic burning of hydrogen and Chlorine; Ammonia by the Mont Cenis and Cassale processes utilizing a catalyst and pressure; Calcium Hypochlorite, (Perchloron) by the chlorination of lime slurry and salting out by means of Sodium chloride; Ferric chloride by reaction of iron and hydrochloric acid and subsequent chlorination of ferrous chloride formed; Hydrogen Peroxide by electrolytic decomposition and vacuum distillation; Sodium ortho-silicate by fusion of sand and soda ash and sal ammoniac (ammonium chloride) by reaction of ammonia and hydrogen chloride. Processes used are in general old established methods and are well documented in trade journals and text books, therefore, no attempt will be made to further describe the individual processes.

Waste Sources

Principal sources of industrial waste are:

A) Ammonia plant - cooling waters, NH_4 ON, NH_4 CO_2, NH_2, Na ON, Na_2 CO_3, Na_3 PO_4 and some compressor oils.

B) Hydrogen peroxide plant - cooling water, spent sulfuric acid, and iron.

C) Turbine condenser water

D) Brine Purification - NaCl, NaOH, Na_2CO_3, MgOH, Na_2SO_4, $NaNO_3$.

E) Calcium Hypochlorite Plant - $CaCO_3$, Chlorine, $CaCO_2$, NaCl, $CaOCl_2$, $Ca(OH)_2$ H_2SO_4 and "gunk" the impurities from chlorine production.

Waste Reduction Measures

No formal waste treatment facilities are provided. Fly ash is hauled to a dump.

Survey Procedures

Samples

Samples of the various outfalls and intakes were taken manually at 30-minute intervals. A constant volume was taken each sampling period. These were composited for the periods indicated and delivered to the Public Health Service Laboratory at Grosse Ile immediately following collection.

Flow Measurements

Flows were determined by several current meter measurements at the various outfalls, where practical. Other flows were determined from Departmental water billings and Company determined pumping rates.

Flow Volumes

Outfall No.	Description	Volume g.p.m.	
Perchloron Plant		500	Company Estimate
1	Wye Street	4,500	Pennsalt Chemical Company
			Company Estimate
		15,400	Wy. Chemical Corp.
2	Koppers Corp. No flow measurement made as plant was not operating		
3	Main Street Sewer	20,000	Company Estimate
	Evaporator down	5,930	measured
3½	#15 Turbine	5,800	Company Estimate
4	Power House Flume	26,500	Company Estimate
		25,000	measured
5	Drain #5 - not sampled	7,400	Company Estimate
6	South Sewer	3,000	Company Estimate

Temperature data - degrees centigrade

Sewer Outfall	Date	Time	Temp. °C
Perchloron Plant	3-26	2:30P	15
	3-27	9:30A	15
	3-27	1:00P	15.5
	3-27	3:15P	15
	3-28	8:30A	15
Wye Street	3-26	2:30P	16
	3-27	9:30A	15.5
	3-27	1:00P	16
	3-27	3:15P	16
	3-28	8:30A	15.5
North raw water	3-26	2:30P	15
	3-27	9:30A	15
	3-27	1:00P	--
	3-27	3:15P	16
	3-28	8:30A	15 - 16
WRC (4) #3 Sewer	3-26	2:30P	23
	3-27	9:30A	22
	3-27	1:00P	--
WRC (3) #3½ Sewer	3-26	2:30P	20
#15 Turbine	3-27	9:30A	18
	3-27	1:00P	19.5
	3-27	3:15P	20
	3-28	8:30A	18
South raw water	3-26	2:30P	16
	3-27	9:30A	15
	3-27	1:00P	15
	3-27	3:15P	16
	3-28	8:30A	15.5

Sewer Outfall	Date	Time	Temp. °C
WRC (2) #4 Sewer	3-27	3:15P	16
WRC (1) #6 Sewer	3-27	9:30A	15
	3-27	1:00P	15
	3-27	4:30P	15
	3-28	8:30A	14.5

Laboratory Analyses
Survey #1
Sewer Outfalls

W.R.C.# / Pennsalt#	Raw Average	North Intake	South Intake	1 / 6	2 / 4	3 / 3½	4 / 3	Wye St. / 1	Perchlor Plant
Analyses									
pH		7.4	7.7	7.9	8.1	7.5	11.2	7.7	11.
Phenol (ppb)	34	0	69	0	5	22	4	2	
Chloride	125	148	102	122	300	298	296	806	20,0
Alkalinity	---	---	---	---	---	---	143	---	35
C.O.D.	3	(a)	6	(a)	23	(a)	23	---	0x1
B.O.D.	1.5	---	3	(a)	3	---	8	---	---
Turbidity		49	25	66	38	67	78	103	50
Coli-MPN		---	---	---	---	---	---	---	---
Fecal Coli-MPN		---	---	---	---	---	---	---	---
ABS	.09	0.12	0.07	0.0	0.12	0.06	0.15	0.22	+
Na	80.5	93	68	100	238	196	411	273	9,000
K	2.0	2.0	2.0	2.1	2.2	2.3	3.0	1.8	2
Ca	50	50	50	13	17	42	15	14	4
Mg	32	57.0	8.0	7.1	9.0	9.1	1.0	10.0	9.
SiO_2	1.1	0.2	2.0	0.2	2.3	2.2	3.7	3.8	4.

W.R.C.#				1	2	3	4	Wye St.	Perchlora Plant
Pennsalt#	Raw Average	North Intake	South Intake	6	4	3½	3	1	
Analyses									
Total Iron	116	0.14	0.18	0.0	0.02	0.15	0.04	0.04	0.04
SO_4	31	33	29	47	33	33	138	35	+
Dissolved Solids	380	404	356	374	685	692	932	1559	37,900
Suspended Solids	25	27	22	36	62	48	145	172	725
Cu		*	+	*	+	*	*	*	*
Cd		0.03	+	*	+	0.03	*	0.01	0.01
Ni		0.02	+	*	+	0.01	*	0.01	0.01
Zn		0.04	+	*	+	0.05	0.01	*	*
Pb		2.24	+	*	*	0.17	*	0.05	0.14
Total Cr		0.21	+	*	*	*	*	*	0.03
Chlorine Residual		Present	0	Present	0	0	0	Present	0.3%
				Survey #2					
pH		7.4	8.0	7.9	8.3	7.6	11.0	8.3	10.5
Phenol (ppb)	5.5	10	1	3	30	5	3	0	0
Chloride	136	169	103	140	390	114	213	770	19,500
Alkalinity		---	---	---	---	---	98	---	---
C.O.D.	20	26	15	20	11	52	20	113	Oxid.
B.O.D.	3	---	6	---	4	6	11	17	Cl-int.
Turbidity		25	25	47	33	25	86	114	360
Coli-MPN		20	20	20	---	---	---	20	20
Fecal Coli-MPN		10	10	10	---	---	---	10	10
ABS	.09	0.09	0.10	0.12	0.17	0.06	0.40	1.10	+
Na	77	86	69	90	275	76	348	435	+
K	2.0	2.0	1.9	2.1	3.0	2.2	2.5	2.5	+

W.R.C.#				1	2	3	4	Wye St.	Perchloron Plant
Pennsalt#	Raw Average	North Intake	South Intake	6	4	3½	3	1	
Analyses									
Ca	49	54	44	51	45	45	7.2	15	5,430
Mg	8.5	8.6	8.4	8.9	9.2	8.5	0.6	1.0	50
SiO_2	2.3	2.6	2.1	2.3	2.2	2.2	1.6	3.1	7.4
Total Iron	.41	0.51	0.32	0.10	0.23	0.21	0.03	0.04	0.02
SO_4	38	42	35	38	47	34	138	38	+
Dissolved Solids	368	395	341	400	724	348	723	1452	33,800
Susp. Solids	22	26	19	27	44	22	141	187	757
Cu		*	*	*	*	*	*	*	*
Cd		*	*	*	*	*	*	*	*
Ni		0.02	*	0.01	*	0.05	0.01	0.02	0.03
Zn		0.04	0.04	0.04	0.05	0.08	0.04	*	*
Pb		*	*	*	*	*	*	*	*
Total Cr		*	*	0.01	*	*	*	0.01	*
Chlorine Residual		0	0	0	---	0	0	4g	Present

Notes: (1) +insufficient sample, (2) (a) chlorine interference

(3) *not detected at 0.01 ppm (4) all values except pH are expressed as mg/l unless noted.

Summary of Calculated Data
Survey #1
Pounds per Day

Sewer	Chlorides	Sodium	Potassium	Dissolved Solids	Susp. Solids	Residual Chlorine
Perchloron	131,000	58,900	152	247,500	4,620	19,800
Wye St.	163,300	46,200		283,000	35,250	Present
Main Street	41,100	79,500	240	132,500	28,800	0
#15 Turbine	12,050	8,050	No Change	21,700	1,600	Present

Sewer	Chlorides	Sodium	Potassium	Dissolved Solids	Susp. Solids	Residual Chlorine
Power House	55,600	50,200	No Change	96,900	11,800	0
South Sewer	Net decrease	no change	No Change	net decrease	396	Present
		Survey #2				
Perchloron	127,800	not tested	not tested	221,000	4,850	Present
Wye Street	152,000	85,900		260,160	39,650	11,760
Main Street	18,480	65,100	120	85,200	28,600	0
#15 Turbine	Net decrease			net decrease	no change	0
Power House	80,700	2,924		113,000	7,000	0
South Sewer	No change			1,155	no change	0

Calculations

lbs./day = flow (mgd) x 8.34 (lbs./gal) x (eff.-raw) mg/l

Survey #1

Perchloron Plant

Flow = 550 g.p.m. x 1440 min./day ÷ 1,000,000 = .792 m.g.d.

Phenol - net decrease

Chlorides - .792 x 8.34 x (20,000-125) = 131,000 lbs./day

Sodium - .792 x 8.34 x (9,000-80.5) = 58,900 lbs./day

Potassium - .792 x 8.34 x (25-2) = 152 lbs./day

Calcium - net decrease

Magnesium - net decrease

Total Iron - net decrease

Dissolved Solids - .792 x 8.34 x (37,900-380) = 247,500 lbs./day

Suspended Solids - .792 x 8.34 x (725-25) = 4620 lbs./day

Chlorine residual - .792 x 8.34 x (3,000) = 19,800 lbs./day

Wye Street

Flow - 20,000 g.p.m. x 1440 min./day ÷ 1,000,000 = 28.8 m.g.d.

Phenol - net decrease

Chloride - 28.8 x 8.34 x (806-125) = 163,300 lbs./day

Sodium - 28.8 x 8.34 x (273-80.5) = 46,200 lbs./day

Dissolved Solids - 28.8 x 8.34 x (1559-380) = 283,000 lbs./day

Suspended Solids - 28.8 x 8.34 x (172-25) = 35,250 lbs./day

ABS - 28.8 x 8.34 x (.22-.09) = 31.2 lbs./day

Main Street Sewer (WRC #4)

Flow - 20,000 g.p.m. = 28.8 m.g.d.

Phenol - net decrease

Chloride - 28.8 x 8.34 x (296-125) = 41,100 lbs./day

C.O.D. - 28.8 x 8.34 x (23-3) = 4810 lbs./day

B.O.D. - 28.8 x 8.34 x (8-1.5) = 1560 lbs./day

Sodium - 28.8 x 8.34 x (411-80.5) = 79,500 lbs./day

Potassium - 28.8 x 8.34 x (3.0-2.0) = 240 lbs./day

Calcium - net decrease

Sulfate - 28.8 x 8.34 x (138-31) = 25,700 lbs./day

Dissolved Solids - 28.8 x 8.34 x (932-380) = 132,500 lbs./day

Suspended Solids - 28.8 x 8.34 x (145-25) = 28,800 lbs./day

#15 Turbine (WRC #3)

Flow - 5,800 g.p.m. x 1440 ÷ 1,000,000 = 8.35 m.g.d.

Phenol - net decrease

Chloride - 8.35 x 8.34 x (298-125) = 12,050 lbs./day

Sodium - 8.35 x 8.34 x (196-80.5) = 8,050 lbs./day

Dissolved Solids - 8.35 x 8.34 x (692-380) = 21,700 lbs./day

Suspended Solids - 8.35 x 8.34 x (48-25) = 1600 lbs./day

Power House Flume (NRC #2)

Flow - 26,500 g.p.m. x 1440 ÷ 1,000,000 = 38.1 m.g.d.

Phenol - net decrease

Chloride - 38.1 x 8.34 x (300-125) = 55,600 lbs./day

Sodium - 38.1 x 8.34 x (238-80.5) = 50,200 lbs./day

C.O.D. - 38.1 x 8.34 x (23-3) = 6350 lbs./day

Dissolved Solids - 38.1 x 8.34 x (685-380) = 96,900 lbs./day

Suspended Solids - 38.1 x 8.34 x (62-25) = 11,800 lbs./day

South Sewer (NRC #1)

Flow - 3000 g.p.m. x 1440 ÷ 1,000,000 = 4.32 m.g.d.

Phenol - net decrease

Chloride - net decrease

Dissolved Solids - net decrease

Suspended Solids - 4.32 x 8.34 x (36-25) = 396 lbs./day

Survey #2

Perchloron Plant

Phenol - net decrease

Chloride - .792 x 8.34 x (19,500-136) = 127,800 lbs./day

Calcium - .792 x 8.34 x (5430-49) = 35,250 lbs./day

Magnesium - .792 x 8.34 x (50-8.5) = 274 lbs./day

Dissolved Solids - .792 x 8.34 x (33,800-368) = 221,000 lbs./day

Suspended Solids - .792 x 8.34 x (757-22) = 4850 lbs./day

Wye Street

Phenol - net decrease

Chloride - 28.8 x 8.34 x (770-136) = 152,000 lbs./day

C.O.D. - 28.8 x 8.34 x (113-20) = 22,300 lbs./day

B.O.D. - 28.8 x 8.34 x (17-3) = 3365 lbs./day

ABS - 28.8 x 8.34 x (1.1-.1) = 240 lbs./day

Sodium - 28.8 x 8.34 x (435-77) = 85,900 lbs./day

Dissolved Solids - 28.8 x 8.34 x (1452-368) = 260,160 lbs./day

Suspended Solids - 28.8 x 8.34 x (187-22) = 39,650 lbs./day

Chlorine residual - 28.8 x 8.34 x 49 = 11,760 lbs./day

Main Street Sewer (WRC #4)

Phenol - net decrease

Potassium - 28.8 x 8.34 x (2.5-2.0) = 120 lbs./day

Chloride - 28.8 x 8.34 x (213-136) = 18,480 lbs./day

ABS - 28.8 x 8.34 x (.4-.1) = 72 lbs./day

Sodium - 28.8 x 8.34 x (348-77) = 65,100 lbs./day

Sulfate - 28.8 x 8.34 x (138-38) = 24,000 lbs./day

Dissolved Solids - 28.8 x 8.34 x (723-268) = 85,200 lbs./day

Suspended Solids - 28.8 x 8.34 x (141-22) = 28,600 lbs./day

B.O.D. - 28.8 x 8.34 x (11-3) = 1920 lbs./day

#15 Turbine (WRC #3)

Phenol - net decrease

Chloride - net decrease

C.O.D. - 8.35 x 8.34 x (52-20) = 2,227 lbs./day

Dissolved Solids - net decrease

Suspended Solids - no change

Power House Flume (WRC #2)

Phenol - 38.1 x 8.34 x (.030-.005) = 7.9 lbs./day

Chloride - 38.1 x 8.34 x (390-136) = 80,700 lbs./day

ABS - 38.1 x 8.34 x (0.17-.1) = 50.8 lbs./day

Sodium - 38.1 x 8.34 x (275-77) = 62,924 lbs./day

Sulfate - 38.1 x 8.34 x (47-38) = 2880 lbs./day

Dissolved Solids - 38.1 x 8.34 x (724-368) = 113,000 lbs./day

Suspended Solids - 38.1 x 8.34 x (44-22) = 7000 lbs./day

South Sewer (WRC #1)

Phenol - net decrease

Chloride - no change

Sodium - 4.32 x 8.34 x (90-77) = 468 lbs./day

Dissolved Solids - 4.32 x 8.34 x (400-368) = 1155 lbs./day

Suspended Solids - no change

Summary

1. Wye Street sewer is used jointly by Pennsalt Chemical Company and Wyandotte Chemicals Corporation South plant. Pennsalt Chemical Company flow is 4,500 g.p.m. while Wyandotte Chemicals Corporation is 15,900 g.p.m. Pennsalt's contribution is 550 g.p.m. from the Perchloron plant and 3950 g.p.m. cooling waters. Chlorine in the sewer amounting to 19,800 lbs./day in Survey #1 and 11,760 lbs./day in Survey #2 is almost entirely due to losses from the Pennsalt Perchloron operation. Suspended solids chargeable to Pennsalt amount to 4,620 lbs. in Survey #1 and 4,850 lbs. in Survey #2, while 30,630 lbs./day in Survey #1 and 34,800 lbs./day in Survey #2 are chargeable to Wyandotte Chemicals.

2. A portion of the plant effluent is discharged to the Wayne County Drain No. 5. This waste originates primarily in the peroxide plant and consists of cooling water, spent sulfuric acid and iron. Company estimates of flow are 7400 g.p.m. of which bulk is uncontaminated cooling waters. No samples were taken of this discharge because (1) the sewer is submerged and any sample collected would not be representative of the Company discharge. (2) Until the sewage plant expansion at Wyandotte is completed, there will be a discharge of raw sewage in this sewer which would also distort the Company waste picture.

3. This Company produces at this plant: chlorine, caustic soda, calcium hypochlorite, hydrogen peroxide, ammonium chloride, ammonia, hydrochloric acid, ferric chloride, and sodium silicate.

4. There are six sewer outfalls with an average combined discharge of 67,200 g.p.m.

5. This waste discharges contain following quantities of waste materials:

Material	Survey #1 lbs./day	Survey #2 lbs./day
Phenol	Net decrease	Net decrease
Chloride	179,065	224,480
Sodium	183,173	---
Dissolved Solids	479,875	421,355
Suspended Solids	45,826	40,500
Chlorine (Perchloron)	19,800	11,760

Report by: G. Calhoun

bmc

PENNSALT CHEMICALS CORPORATION
EAST PLANT

DISCUSSION OF RESULTS

The Pennsalt East Plant operates four outfall sewers which were sampled by Public Health Service personnel. In addition, samples were collected by Public Health Service personnel from the Wye Street sewer which receives one-quarter of its flow from Pennsalt waste discharges and three-quarters of its flow from Wyandotte Chemical Corporation (South Plant). Because Wyandotte contributes the majority of the flow here, this data is included in the report of the Wyandotte Chemical Corporation.

The Public Health Service during the latter half of 1963 sampled individually the twin-box sewers and called them outfall Nos. 4 and 5. Actually they are the same sewer.

Review of the data from the four outfalls studied by both the Michigan Water Resources Commission and the Public Health Service shows that these effluents are relatively free of waste pollutants. However, excessive chloride discharges which can create problems in downstream domestic and industrial water intakes present an interesting picture. For comparative purposes, chloride results of the two separate investigations are shown below:

	Outfall No.*			
	1	2	3	4
MWRC (Aug.)	131	345	206	255
PHS** (Aug.)	830	596	184	279

* Data in mg/l
** Average of 9-12 results each outfall

Average chloride content of the intake water was 125 mg/l. Net increases in chloride loadings from the two separate investigations are tabulated below assuming constant flow.

	Outfall No.*			
	1	2	3	4
MWRC (Aug.)	no change	68,200	12,500	29,800
PHS (Aug.)	25,400	150,000	4,200	45,000

* Values in pounds per day

The Pennsalt portion of the Wye Street sewer and the Perchloron Plant outfalls, not investigated by the Public Health Service personnel, were studied by the Michigan Water Resources Commission in their comprehensive survey. Chloride contribution from these two outfalls are shown below:

	Wye Street	Perchloron Plant
MWRC mg/l	788	19,750
MWRC lbs/day (net)	159,000	129,500

Total combined chloride discharged from all outfalls approximates 500,000 pounds per day which is approximately 7 per cent of the chloride flow in the Trenton Channel. This quantity changes the Detroit River water quality considerably, and seriously reduces its value as a source of industrial water. During the Public Health Service outfall sampling study at outfall No. 1 on May 7, 1963, an unusually high phenol reading occurred of 1,240 mg/l. It was learned, at a later date, that the company, in trying to improve the phenol problem at their West Plant had channeled the phenol wastes to the East Plant and were experimenting with oxidizing the phenols with the chlorine bearing wastes of the East Plant. The experiment apparently was not functioning as expected at the time, but later it was learned that the process proved effective and was put into operation. Results are not available to verify this new operation. Because the samples collected this day were not typical of the outfall, the results were omitted from the computations.

Results of suspended solids determinations are summarized below:

	OUTFALL NO.					
	1	2	3	4	Wye Street	Perchloron
MWRC mg/l	31	53	35	143	180	741
#/day	198	9,400	800	28,700	38,000	4,700
PHS mg/l	53	113	41	147		
#/day	340	20,000	930	29,400		

All outfalls combined produce a total suspended solids discharge of approximately 90,000 pounds per day.

As in the discharges from the Pennsalt West Plant, the East Plant also produces a waste containing large quantities of oxidizing agents. This is reflected in the coliform bacterial plate counts at the Grosse Ile toll bridge stations which exhibit low densities when one would expect high counts. Presumably, the waste is having a toxic effect on the bacteria. The total chlorine losses from this plant averaged 15,780 pounds per day.

CONCLUSIONS AND RECOMMENDATIONS

1. Discharge of chlorides from this plant totals 500,000 pounds per day; or 7 percent of the chloride flow in the Trenton Channel. The industry should begin investigation of methods to dispose satisfactorily of chlorides other than discharge into the Detroit River. While no practical method of removal from plant effluent now exists, alternate methods of disposal of concentrated brines, such as subsurface disposal, should be investigated.

2. Suspended solids discharged which totaled 90,000 pounds be limited to a level of 50,000 pounds per day.

PENNSALT CHEMICALS CORPORATION

Outfall No. 1

Date	Time	Temp. °C	pH	Phenols ppb	Chloride ppm	Alkalinity ppm	COD ppm	Grease ppm	Iron ppm	Conductivity Units	Total Solids ppm	Suspended Solids ppm	Settleable Solids ppm
8/8/62			9.1	2	127								
8/29/62			9.8	1	230								
10/17/62	10	20.0	8.2	0	235								
10/29/62	11	18.5	11.0	4	130		79						
5/7/63*	12*	21.0*	8.2*	1,240*	350*	120*						157*	127*
7/10/63	12	28.0	9.4	0	121	120					560	119	
7/24/63	18	28.2		0	468						644	66	48
7/26/63	18	31.0	9.4	8	81	150					250	53	
7/28/63	18	33.0			75						300		
7/30/63	18	31.5			0.6%							38	38
10/18/63	11	22.0	10.8					3					
10/22/63	14	19.5	8.6					4				19	
10/23/63	10	19.0	9.0					5				51	49
11/21/63	12	19.0						7		580		33	
11/26/63	15	16.0						17	2.4			52	34
12/5/63	13	11.0						13		530		48	
Average			9.5	2	830	135		8		555	439	53	42
Maximum			11.0	8	6,000	150		17		580	644	119	49
Minimum			8.2	0	75	120		3		530	250	19	34

* Omitted from calculations

PENNSALT CHEMICALS CORPORATION

Outfall No. 1

Date	Time	Iron ppm	ABS ppm	Cu ppm	Ni ppm	Zn ppm	Pb ppm	Cr ppm	Cd ppm	NH_3 Nit.	Org. Nit
7/18/63		1.72	.24	.02	*	*	.04	*	*		
7/24/63	18									7.78	.49
7/28/63	18	1.51	.10	*	.01	.04	.01	.03	*	26.00	1.52
Average		1.62	.17				0.03			16.9	1.01

PENNSALT CHEMICALS CORPORATION

Outfall No. 2

Date	Time	Temp. °C	pH	Phenols ppb	Chloride ppm	Alkalinity ppm	COD ppm	Grease ppm	Conductivity Units	Total Solids ppm	Suspended Solids ppm	Settleable Solids ppm
8/8/62			8.3	0	262							
8/29/62			8.7	3	273							
9/19/62	10	25.0	8.4		243							
10/23/62	10	24.5	8.1	1	350		52		1,200			
11/21/62	10	11.0	8.5	13	655	865	18		2,160			
4/16/63	11	19.0	7.7	5	1,100						81	
5/7/63	12	17.0	8.9	4	280	105					50	
7/10/63	12	25.0	8.0	0	146	87				440	52	
7/24/63	18	33.2		2	2,225					0.4%	279	
7/26/63	18	31.5		1	173					480	13	
7/30/63	18	35.5			850					0.1%	57	48
10/18/63	11	25.5	6.8					10			251	238
10/22/63	14	30.0	8.8					4			101	87
10/23/63	10	29.0	8.0					3			38	30
11/21/63	12	23.0						6	1,240		132	
12/3/63	12	15.5							1,180		193	175
12/5/63	13	15.5							1,140		106	
Average			8.2	3.2	596	352	35	6.0	1,384	1,480	113	116
Maximum			8.9	13	2,225	865	52	10	2,160	4,000	279	238
Minimum			6.8	0	146	87	18	3	1,140	440	13	30

PENNSALT CHEMICALS CORPORATION

Outfall No. 2

Date	Time	NH_3 Nit	Org. Nit.
7/24/63	18	.77	.16
7/30/63	18	.49	.34
Average		0.63	0.25

PENNSALT CHEMICALS CORPORATION

Outfall No. 3

Date	Time	Temp. °C	pH	Phenols ppb	Chloride ppm	Alkalinity ppm	COD ppm	Grease ppm	Conductivity Units	Total Solids ppm	Suspended Solids ppm	Settleable Solids ppm
8/8/62			9.4	8	198							
8/29/62			8.8	2	183		451		96			
9/19/62	10	25.0	8.4	3	100							
10/23/62	10	26.0	10.0	5	225		40		600			
11/21/62	10	17.5	9.3	18	355	960	24		2,800			
4/16/63	11	22.0	7.9	10	118							
7/10/63	12	28.0	7.8	4	125	95				430	0	0
7/24/63	19	35.5		0	380					588		
7/26/63	18	33.0		0	84					240	16	18
7/30/63	18	39.5			75					320	47	47
10/18/63	11	29.0	7.5					9			23	
10/22/63	14	32.0	7.6					6			32	20
10/23/63	10	30.0	7.3					4			32	
11/21/63	12	25.0						8	600		138	27
12/3/63	12	18.0							490		40	28
12/5/63	13	16.0							520		38	27
Average			8.4	5.6	184		172		851	395	41	24
Maximum			10.0	18	960		451		2,800	588	138	47
Minimum			7.3	0	95		24		96	240	240	0

PENNSALT CHEMICALS CORPORATION

Outfall No. 3

Date Date	Time	NH_3 Nit	Org. Nit.
7/24/63	19	.44	.03

PENNSALT CHEMICALS CORPORATION

Outfall No. 4

Date	Time	Temp. °C	pH	Phenols ppb	Chloride ppm	Alkalinity ppm	COD ppm	Grease ppm	Conductivity Units	Total Solids ppm	Suspended Solids ppm	Settleable Solids ppm	Turbidity
8/8/62			9.2	0	862								
8/29/62			8.9	3	168								
9/19/62	10	30.0	9.5	2	490								
10/23/62	10	26.0	10.0	5	385		89		2,000				
11/21/62	10	15.0	10.3	2	165	102	L1,900		1,960				
12/3/62	10	13.5	9.6	18	97		80		112				L25
4/16/63	11	12.0	7.7	4	183						22		
7/10/63	12	27.0	8.8	0	233	63				620	106		
7/24/63	19	30.0		0	404					970	126	113	
7/26/63	18	32.0	8.3	0	152					510	74	19	
7/28/63	19	30.0			125					430			
7/30/63	18	28.0			80					330	63	56	
10/18/63	11	26.5	11.3					6			185	146	
10/22/63	14	19.5	8.8					5			97	82	
10/23/63	10	31.0	10.0					3			118	67	
11/21/63	12	20.0						5	12,600		61	59	
12/3/63	11	6.5							970		552	422	
12/5/63	13	18.0							1,840		206	149	
Average			9.4	3.4	279	83		5.0	3,247	527	147	124	
Maximum			11.3	18	862	102		6.0	12,600	970	552	422	
Minimum			7.7	0	80	63		3.0	112	330	22	19	

MICHIGAN WATER RESOURCES COMMISSION

Report of Survey

Pennsalt Chemicals Corporation
4655 Biddle
Wyandotte, Michigan

West Plant
Riverview, Michigan

Organization of Survey

Flow measurements, samples and pertinent plant data were obtained by the staff of the Michigan Water Resources Commission.

Analytical determinations were made at the Grosse Ile and Chicago Laboratories of the United States Public Health Service.

Dates of Survey

Survey #1 - 2:30 p.m. March 25 to 2:30 p.m. March 26, 1963
Survey #2 - 2;30 p.m. March 26 to 2:30 p.m. March 27, 1963

Purpose of the Survey

This survey was conducted to obtain current wastes data and information for the Detroit River-Lake Erie Project Survey being conducted by the United States Public Health Service.

Personnel Participating

Pennsalt Chemicals Corporation

Dr. Gillette, Research and Technical Director
Mr. J. Fox, Chief Chemist

Michigan Water Resources Commission

G. Calhoun, District Sanitary Engineer
A. Dennistón, Sanitary Engineer
J. Pope, Water Pollution Investigator
E. Stolnicki, General Foreman

U. S. Public Health Service

D. Krawczyk, Chief Chemist
Members of Laboratory staff

Location of Plant

The West Plant of Pennsalt Chemicals Corporation is located on the southwest corner of Jefferson and Pennsylvania Roads within the City of Riverview. The plant is part of the Industrial Chemicals Division which is located at 4655 Biddle Street, Wyandotte, Michigan.

Plant History

This plant was operated for a number of years as the Sharples Chemicals, Inc. During recent years, the plant was purchased by Pennsalt Chemicals Corporation and operated under the Industrial Chemicals Division.

Employees

About 300 persons are presently employed at this plant.

Operations

The plant operates on a three shift, seven day per week basis.

Raw Materials

Raw materials used in process are:

Methanol, Ethanol, Isopropanol, Butanol, Amyl Alcohol, Urea, Amines, Ammonia, Carbon Disulphide, Hydrochloric Acid, Di Thio Carbamates, Pentane, Acetic Acid and smaller quantities of other organic compouds. Quantities used were not disclosed.

Production

The prindple products manufactured at this plant are:

a. methyl, ethyl, isopropyl, butyl, and amyl amines
b. methyl, ethyl, and butyl di thio carbamates
c. methyl urea, ethyl, isopropyl, and butyl thio ureas
d. intermediates to produce above products.

Quantities produced were not disclosed.

Water Supply

Water is secured from two sources. First, from City of Wyandotte supply for sanitary, drinking, and some limited processing operations. Second, from the intakes of the Corporation's East Plant located on the Trenton Channel. This water is used entirely for processing and cooling.

Sanitary Wastes

Sanitary wastes are collected in a separate sewer system and discharged to the Wayne County Road Commission sewerage system (Wyandotte Plant).

Process Wastes

Process wastes are discharged after treatment through a 54" culvert to Monguagon Creek, a tributary of the Detroit River (Trenton Channel) entering the channel at the south side of the Grosse Ile Toll Bridge.

Manufacturing Process

This plant is a synthetic organic production facility producing amines, alcohols and ureas. The products produced are related to a few prime raw materials as indicated under Raw Materials. No effort will be made to describe detailed

manufacturing procedures of each process; however, standard organic reactions such as chlorination, water absorption, hydrolysis, distillation, esterification, condensation, catylitic reactions, and Friedel Crafts reactions are utilized. Most organic chemical reactions are complex and many by-products are formed so that in many cases traces of these by-products will be found in the wastes.

Waste Sources

Principal sources of industrial wastes are:

a. Process wash waters
b. Vacuum jet waters
c. Cooling waters
d. Supernatant liquors

Waste Reduction Measures

All combustible wastes which can be collected (still heads, still bottoms, pitches, tars, etc, for which there is no sale value) are hauled to a rural area and burned. Almost every process yields some material of this nature, and most of it comprises still bottoms or residues.

Filter clays are collected and either buried at the plant site or hauled to a commercial dumping area.

Formal waste treatment facilities consist of four (4) lagoons, three (3) of which are equipped with oil skimming devices. Phenols are first discharged to a holding pond having about six (6) days detention time. This overflows to pond #3 equipped with an oil skimmer, thence to pond #4 also equipped with a skimmer, thence to Monguagon Creek. Oily wastes are discharged to pond #2 thence to the #3 and #4 ponds and finally to the creek. The phenol pond (#1) is also equipped with an oil skimmer. Brine waters are discharged directly to pond #4 and thence to the creek.

Survey Procedures

Sample Collection

Samples of the discharge to the creek were collected at 15-minute intervals by means of an automatic sampler. Constant volume samples were obtained and composited for the survey periods. Composite raw water samples were collected by hand for the survey periods.

Flow measurements

Flow measurements were made with a current meter. Head through the 54' culvert was measured by means of a L & S water level recorder. Head readings showed little variation over the entire survey period.

Flow volumes

Flow measured 4690 gallons per minute. Twelve month averages computed by the Company from water usage and billings to the various departments showed 4700 gallons per minute. This average will be used in the calculations. This is equivalent to 6.77 million gallons per day.

Sample Analysis	Survey #1 raw	Survey #1 effluent	Survey #2 raw	Survey #2 effluent
pH	7.7	10.1	8.0	10.4
Phenol - p.p.b.	69	800	1	510
Chloride	103	212	98	300
Alkalinity	---	82	---	71
C.O.D.	6	256	15	(a)
B.O.D.	3	---	6	(a)
ABS	0.07	0.12	0.10	0.17
Sodium	68	218	69	281
Potassium	2.0	2.2	1.9	3.3
Calcium	50	159	44	7.2
Magnesium	8.0	4.4	8.4	5.0
SiO_2	2.0	2.2	2.1	2.4
Total Iron	0.18	0.02	0.32	0.05
SO_4	29	45	35	48
Dissolved Solids	356	541	341	682
Suspended Solids	22	100	19	108
Copper	+	*	*	+
Cadmium	+	0.02	*	+
Nickel	+	0.01	*	+
Zinc	+	0.03	0.04	+
Lead	+	0.02	*	*
Total Chromium	+	0.05	*	*
Total Solids	380	600 (a)	290	720 (a)
Oxidizing Agent	0	185	0	240
Turbidity	< 25	47	< 25	47
Oils (B)	---	5.9	---	5.1

Notes:
1. All results except pH expressed in mg/l except as noted.
2. *not detected at sensitivity of analysis
3. +insufficient sample
4. (a) chlorine interference
5. (B) data furnished by Company on split sample

Summary of Computed Data

Compound or test	lbs/day Survey #1	lbs/day Survey #2
Phenol	41.3	28.7
Chloride	6154	11,404
C.O.D.	14,115	---
ABS	2.8	3.9
Sodium	8,469	11,969
Potassium	11.3	78.8
Calcium	6,154	--decrease
Silicates (SiO_2)	11.3	--no change
Sulfate	902	---
Dissolved Solids	10,445	19,253
Suspended Solids	4,404	5,025
Total Solids	12,421	24,278
Oxidizing Agent	10,445	13,550
Oils	333 (44.5 gal/day)	287.9 (38.4 gals/day)

Computations

Survey #1 lbs/day = flow m.g.d. x 8.34 lbs/gal x mg/l

Phenol
6.77 x 8.34 x (.8-.069) = 41.3 lbs/day

Chloride
6.77 x 8.34 x (212-103) = 6154 lbs/day

C.O.D.
6.77 x 8.34 x (256-6) = 14,115 lbs/day

ABS
6.77 x 8.34 x (0.12-0.07) = 2.8 lbs/day

Sodium
6.77 x 8.34 x (218-68) = 8,469 lbs/day

Potassium
6.77 x 8.34 x (2.2-2.0) = 11.3 lbs/day

Calcium
6.77 x 8.34 x (159-50) = 6154 lbs/day

Magnesium
net decrease

SiO_2
6.77 x 8.34 x (2.2-2.0) = 11.3 lbs/day

Iron
net decrease

SO_4
6.77 x 8.34 x (45-29) = 902 lbs/day

Dissolved Solids
6.77 x 8.34 x (541-356) = 10,445 lbs/day

Suspended Solids
6.77 x 8.34 x (100-22) = 4404 lbs/day

Copper
no change

Cadmium
no significant change

Nickel
no significant change

Zinc
no significant chage

Lead
no significant change

Chromium
no significant change

Total Solids
6.77 x 8.34 x (600-380) = 12,421 lbs/day

Oxidizing Agents
6.77 x 8.34 x (185) = 10,445 lbs/day

Oils
6.77 x 8.34 x (5.9) = 333 lbs/day
333/7.5 lbs/gal = 44.5 gals/day

Survey #2

Phenols
6.77 x 8.34 x (.510-.009) = 28.7 lbs/day

Chloride
6.77 x 8.34 x (300-98) = 11,404 lbs/day

A.B.S.
6.77 x 8.34 x (.17-.10) = 3.9 lbs/day

Sodium
6.77 x 8.34 x (281-69) = 11,969 lbs/day

Potassium
6.77 x 8.34 x (3.3-1.9) = 78.8 lbs/day

Calcium
net decrease

Magnesium
net decrease

SiO_2
no significant change

Dissolved Solids
6.77 x 8.34 x (682-341) = 19,253 lbs/day

Suspended Solids
6.77 x 8.34 x (108-19) = 5,025 lbs/day

Copper - not reported

Nickel - not reported

Cadmium - not reported

Zinc - not reported

Lead
no significant change

Total Chromium
no significant change

Total Solids
6.77 x 8.34 x (720-290) = 24,278 lbs/day

Oxidizing Agent
6.77 x 8.34 x (240) = 13,550 lbs/day

Oils
6.77 x 8.34 x (5.1) = 287.9 lbs/day
287.9/7.5 lbs/gal = 38.4 gal/day

Summary

1. This plant produces synthetic organic compounds such as: alcohols, amines and ureas.

2. Major pollutants are:

   a. Phenol - 41.3 lbs/day Survey #1
      28.7 lbs/day Survey #2

   b. Chlorides - 6,150 lbs/day Survey #1
      11,404 lbs/day Survey #2

   c. Suspended Solids - 4,404 lbs/day Survey #1
      5,025 lbs/day Survey #2

   d. Oxidizing Agent - 10,445 lbs/day Survey #1
      13,550 lbs/day Survey #2

   e. Oils - 333 lbs/day Survey #1
      287 lbs/day Survey #2

3. Wastes flows averaged 6.77 m.g.d.

4. Waste treatment facilities consists of holding lagoons and oil separators, burning and land disposal.

5. Production during survey was at a normal level.

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PENNSALT CHEMICALS CORPORATION
WEST PLANT

DISCUSSION OF RESULTS

Three different surveys were conducted on this company.

The first was an outfall grab sampling program by the Public Health Service throughout the duration of the Project. The second was a comprehensive survey by the Michigan Water Resources Commission in March 1963. The third was an outfall composite survey in July 1963 by Public Health Service personnel with samples collected every four hours (not in accordance with flow) and composited into a 24-hour sample. In addition, seven samples were collected in Monguagon Creek at Biddle Avenue, July - December 1963, approximately one-half mile below the outfall to Monguagon Creek. This sample reflects almost entirely the waste discharge from Pennsalt West Plant.

The effluent from the Pennsalt West Plant is highly organic in nature and contains materials that interfere with standard analytical chemistry techniques. That the effluent is highly organic is reflected in the results which show average results of phenols, and oxidizing agents during the comprehensive survey to be 0.655 mg/l and 213 mg/l, respectively. The COD test was severely inhibited by the interferences. In addition, this waste appears to reduce the bacterial content of the river water shoreward sampling stations in the Trenton Channel by its toxic action. Little is known regarding what effect this effluent may have on aquatic life, but presumably it would be damaging.

For comparative purposes, phenol results are shown for the four survey methods, with results reported in mg/l.

Monguagon Creek at Biddle	MWRC Survey March 1963	PHS Outfall	PHS Composite, July 1963
0.866	0.655	1.156	0.887

The sample results clearly show the values to be far in excess of International

Joint Commission objectives. To protect water uses in the Trenton Channel, the phenol discharge should be limited to a level of 0.020 mg/l or 1 pound per day.

Another interesting observation at the plant was noted from results of samples collected in Huntington Creek, a tributary to Monguagon which flows near the Pennsalt waste treatment lagoons. These results averaged 0.852 mg/l in phenols during the outfall sampling program and 0.550 mg/l in phenols during the Public Health Service composite survey. Upstream samples above the Pennsalt Plant show practically negligible phenol results, therefore, it can be concluded that leakage from these lagoons is occurring and draining to Huntington Creek. The flow from this Creek is low, therefore, this problem is minor.

Other waste constituents studied reflect only minor differences between raw water and waste effluent. The pH values should not be overlooked, however, because of the wide fluctuations of 3.0 to 10.6. Chloride values are high, averaging 288 mg/l in the outfall sampling program, but are not considered excessive for discharge to the Trenton Channel.

Suspended solids from the effluent averaged 137 mg/l during the Public Health Service composite survey with practically 80 percent of this being readily settleable material. It is obvious that the settling lagoons of this plant are not performing satisfactorily.

CONCLUSIONS AND RECOMMENDATIONS

1. The entire waste disposal program of this plant should be carefully investigated by company personnel since waste discharges of phenols, oxidizing agents and settleable solids are far in excess of that expected by company officials.

2. Phenol concentration averaging between 0.655 and 1.156 mg/l and 35 to 60 pounds per day should be reduced to a level of 0.020 mg/l or 1 pound per day in the effluent to protect water uses in the Trenton Channel.

3. Settleable solids in the effluent should be reduced by improved operation and maintenance of the treatment methods already in use.

PENNSALT CHEMICALS CORPORATION

OUTFALL NO. 1 (MONGUAGON CREEK)

Date	Time	Temp. °C.	pH	Phenols	Chl. ppm	Alk. ppm	COD ppm	Grease ppm	Iron ppm	Cond. Units	Total Solids ppm	Susp. Solids ppm	Sett. Solids ppm	Turbidity
11/21/62	9	18.0	7.1	4,660	153	78	35			700				
12/4/62	11	14.5	9.5	1,000	180		130			840				39
12/12/62	11	14.5	5.9	92	760					720				<25
12/14/62	9	9.0	9.3	1,123	63									57
12/19/62	12	13.5	3.2		420					2,120				<25
12/26/62	10	12.5	6.6	1,600	156					800				33
1/2/63	12	14.5	9.7	263	200	111								<25
1/17/63	10	16.5	7.2	924	121					460				<25
2/28/63	15	14.5	9.1	1,775		331				600	470	8		<25
3/4/63	10	14.0	8.7	520	244	160				960	580			<25
3/6/63	9	13.0	2.8	1,100	270	84*				1,304	560	23		35
3/14/63			10.0	1,440	600	320				2,320	1,390	83		92
3/20/63	11	17.0	10.2	960	560						1,260	161		40
3/27/63	3	16.5	10.9	690	450						610	119		55
3/29/63	16	18.0	10.6	43	538	132					0.1%			33
10/18/63	10	24.0	6.7					4				29		18
10/22/63	16	20.5	7.1					13				17		
10/23/63	10	24.0	6.2					3				17	5	
Average			8.3	1,156	337	189		7		1,082	839	57		
Maximum			10.9	4,460	760	331		13		2,320	1,390	161		
Minimum			2.8	92	63	78		3		460	470	8		

*Acidity - not figured in average

PENNSALT CHEMICALS CORPORATION

OUTFALL #2 (MONONGAHELA CREEK)

Date	Time	Temp. °C.	pH	Phenols ppb	Chl. ppm	Alk. ppm	COD ppm	Cond. Units	Total Solids ppm	Susp. Solids ppm	Turbidity
11/21/62	9	18.5	6.9	3,740	170	64	72	185			
12/4/62	11	13.5	8.2	995	245		134	996			35
12/14/62	9	8.5	10.6	881	600						60
12/19/62	12	14.5	3.2		430			2,040			L25
12/26/62	10	11.5	6.2	1,710	245		64	1,000			33
1/2/63	12	13.0	9.8	752	200		180				310
1/17/63	10	15.5	7.1	1,290	149			520			L25
2/28/63	15	13.0	9.1	68			312	600	410	5	25
3/4/63	10	13.0	3.0	540	7,000			880	470		L25
3/6/63	9	0.5	7.2	40	305			1,304	940	93	125
3/14/63			7.3	16	250			1,192	774	75	130
3/20/63	11	10.5	10.0	900	455	143			1,060	50	42
3/27/63	3	7.0	8.2	110	310				1,100	108	142
3/29/63	16	17.0	10.6	28	543	84			1,000	158	56
Average			7.7	852	839	97	152	967	822	82	
Maximum			10.6	3,740	7,000	143	312	2,040	1,100	158	
Minimum			3.0	16	149	64	64	185	410	5	

PENNSALT CHEMICALS CORPORATION

WEST PLANT (MONGUAGON CREEK)

Date	Time	Temp. °C.	pH	Phenol ppb	Chloride ppm	Alkalinity ppm	Suspended Solids ppm	Total Solids ppm	Settleable Solids ppm
7/14/63	4	28.5	9.6	110	245	158			
	7	32.0							
	9	31.5							
	14	32.5							
	17	33.0							
	23	33.0					110	700	91
7/15/63	1	32.5							
	7	32.5							
	9	32.0	9.4	9	288	158			
	14	33.0							
	17	34.0							
	23	33.5					153	868	105
7/16/63	1	33.5	8.4	58	272	121			
	7	33.5							
	9	32.0							
	13	32.0							
	17	35.0							
	23	35.0					118	600	64
7/17/63	1	35.0	7.3	1,260	532	117			
	8	35.0							
	9	33.0							
	14	33.0							
	17	35.5							
	23	35.5					162	1,450	106

PENNSALT CHEMICALS CORPORATION

WEST PLANT (MONGUAGON CREEK) (Cont.)

Date	Time	Temp. °C.	pH	Phenol ppb	Chloride ppm	Alkalinity ppm	Suspended Solids ppm	Total Solids ppm	Settleable Solids ppm
7/18/63	1	36.5	8.9	G3,000	720	148			
	5								
	9	36.0							
	13	36.5							
	17	37.5							
	23	37.0					143	.1%	129
Average			8.7	887	411	158	137	924	99
Maximum			9.6	G3,000	720	140	162	1,450	129
Minimum			7.3	9	245	117	110	600	64

PENNSALT CHEMICALS CORPORATION

T48 - MONGUAGON CREEK

Date	Time	Temp. °C.	pH	Phenol ppb	Chl. ppm	Alk. ppm	Total Coliform MF/100ml	NH_3 Nit. ppm	Org. Nit. ppm	Susp. Solids ppm	Total Solids ppm	Sett. Solids ppm
7/14/63	4	20.5	8.5	60	335	98		.6	.58			
	6	19.5										
	9	20.0										
	14	21.5					G1,000					
	17	23.0										
	23	30.0								70	820	38
7/15/63	1	29.0										
	7	30.5										
	9	19.5	8.2	150	204	102		1.15	.34			
	14	24.5										
	17	32.0					10,000					
	24	32.0								33	680	14
7/16/63	1	31.0	9.0	27	179	128	10,000		.12			
	7	30.5										
	9	30.5										
	14	31.5										
	17	33.0										
	23	30.5								59	440	30
7/17/63	1	30.5	7.6	13	351	86		9.28	0			
	8	33.0										
	9	32.5										
	14	35.0										
	17	34.0					10,00					
	23	31.5								31	810	13

PENNSALT CHEMICALS CORPORATION

T48 - MONGUAGON CREEK (Cont.)

Date	Time	Temp. °C.	pH	Phenol ppb	Chl. ppm	Alk. ppm	Total Coliform MF/100ml	NH_3 Nit. ppm	Org. Nit. ppm	Susp. Solids ppm	Total Solids ppm	Sett. Solids ppm
7/18/63	1	29.0	7.8	2,500	720	102		1.85	.58			
	7	32.0										
	9	32.0					300					
	13	35.0										
	17	36.0										
	23	36.0								38	930	34
Average			8.2	550	359	103	6,260	3.24	0.32	46	736	26
Maximum			9.0	2,500	720	128	10,000	9.28	0.58	70	930	38
Minimum			7.6	13	179	86	300	0.67	0	31	440	13

PENNSALT CHEMICALS CORPORATION

T49 - MONGUAGON CREEK

Date	Time	Temp. °C	pH	Phenol ppb	Chl. ppm	Alk. ppm	Total Coliforms MF/100ml	%Fecal Coli.	NH_3 Nit. ppm	Org. Nit. ppm	Susp. Solids ppm	Total Solids ppm	Sett. Solids ppm
7/14/63	4	19.0	7.3	4	220	88			.16	.40			
	6	19.0											
	9	19.5											
	14	21.0					G1,000						
	17	21.0											
	23	19.5									121	660	104
7/15/63	1	18.5											
	7	18.0											
	9	18.0	7.3	0	224	134			1.32				
	14	21.5											
	17	21.5					L10,000						
	23	21.0									177	980	142
7/16/63	1	20.0	7.4	3	219	168	30,000			.07			
	7	18.5											
	9	18.0											
	14	20.0											
	17	20.5											
	22	21.0									21	670	7
7/17/63	1	20.5	7.5		256	234			.26	.28			
	7	20.0											
	9	20.0											
	14	24.5											
	17	24.0					15,000	35					
	23	22.5									133	1,320	126

PENNSALT CHEMICALS CORPORATION

T49 - MONGUAGON CREEK (Cont.)

Date	Time	Temp. °C.	pH	Phenol ppb	Chl. ppm	Alk. ppm	Total Coliforms MF/100ml	%Fecal Coli.	NH_3 Nit. ppm	Org. Nit. ppm	Susp. Solids ppm	Total Solids ppm	Sett. Solids ppm
7/18/63	1	19.0	7.2	17	130	132			.22	.33			
	7	21.0											
	10	22.5					5,900	40					
	13	25.0											
	17	26.0											
	23	25.0									10	460	6
Average			7.3	6.0	210	151	12,000				92	818	77
Maximum			7.5	17	256	234	30,000				177	1,320	142
Minimum			7.2	0	130	88	5,900				10	460	6